

AUTOMOTIVE INDUSTRIES

A C H I L T O N P U B L I C A T I O N

JUNE 1, 1959

MATERIAL HANDLING SHOW NUMBER

Features • • •

**Production of Chevrolet Fenders at Budd Plant
Special Conveyors for Small Parts at Cadillac
The General Electric T64 Gas Turbine Engine
Mechanized Equipment for Truck Bumper Bars
Preview of the Material Handling Exposition
Ford's Automated Lines for Transmission Gears**

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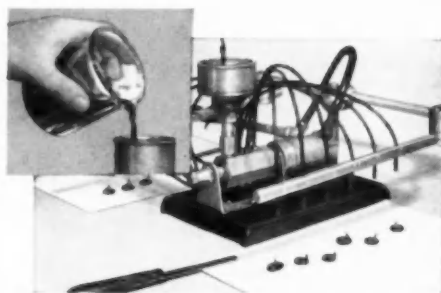
**Automotive and Aviation Manufacturing
ENGINEERING • PRODUCTION • MANAGEMENT**



Bertsch & Co. finds solution to
lubrication problem...with Standard Oil's

RYKON Grease R

*Centralized lube system pumps
grease through
80 ft. lines in cold temperature;
no clogging*



Lab demonstration shows how RYKON Grease R works. Grease is poured into reservoir as a fluid. The shearing action exerted by pump and outlets irreversibly converts fluid to a grease. Grease is ejected from outlet lines.

Problem: Bertsch & Company, Cambridge City, Indiana, makes pinch rolls and other metal bending equipment. A centralized lubrication system used on one pinch roll model had to pump grease 80 feet. Greases tried could not be pumped this distance without clogging lines. Since machines are shipped all over the world and are often in operation in cold climates, Bertsch had additional problems. The grease had to be pumpable in cold temperatures. It had to be foolproof so that customers beyond the reach of service calls would experience no problems.

What was done: Bertsch turned to Standard Oil for help. Standard Oil man, D. M. Simmons had the answer:

RYKON Grease R. This is a rheopectic grease, one that flows like an oil. Its rheopectic properties cause it, under slight shearing stresses, to turn to a thick, durable grease. RYKON Grease R flows to the pump as a fluid, lubricates the bearings as a grease.

What you can do: Maybe you manufacture equipment that needs a centralized lubrication system and you have been looking for a grease like RYKON R. Get the facts about RYKON Grease R from your nearby Standard Oil lubrication specialist anywhere in the 15 Midwest and Rocky Mountain states. Or write **Standard Oil Company (Indiana), 910 South Michigan Ave., Chicago 80, Illinois.**



*You expect more from **STANDARD** and you get it!*



Sons of founder, Harry E. and Robert O. Bertsch talk with Standard Oil lubrication specialist Donald M. Simmons. Don is well qualified to work with customers on difficult lubrication problems. He has the training and experience for it. Don graduated from Purdue. He has seven years service with Standard. He has completed the Standard Oil Sales Engineering School.



**Another construction problem solved . . .
by COTTA HEAVY-DUTY TRANSMISSION**

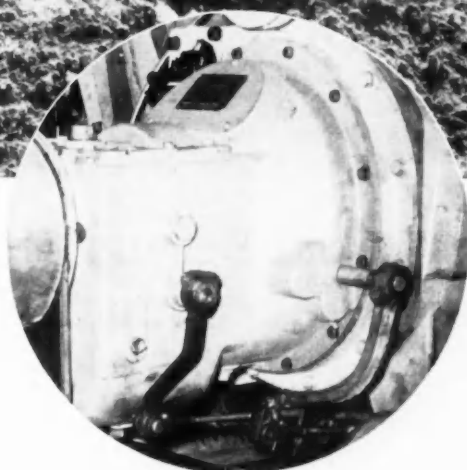


**Insley "Pipeliner" at work digging 30 in.
gas line near Edinburgh, Ind.**

With a special problem to solve, Insley engineers found that a Cotta transmission could easily be adapted for a quick, reliable solution.

On the job illustrated, the new Insley "Pipeliner" excavator digs out turns and rock formations left by the speedier light-duty ditching machine. To facilitate rapid movement from location to location, the excavator was equipped with a special Cotta transmission having one to one forward ratio for digging, and two to one overspeed to keep up with pipeline operations.

If you need large- or small-quantity production of special-purpose or specially engineered heavy-duty transmissions, why not call Cotta? Cotta engineers can supply or design a gear box that will give you dependable, trouble-free service under the toughest conditions. Diagrams and complete specifications sent free on request.



Broad range of ratios

Input torques from 150 to 1,350 ft lbs

**For use on cranes, shovels, rock crushers,
generators, pumps, etc.**

THIS INFORMATION WILL HELP YOU

Sent free on request — diagrams, capacity tables, dimensions, and complete specifications. State your problem — COTTA engineers will help you select the right unit for best performance. Write today.

COTTA TRANSMISSION CO., ROCKFORD, ILLINOIS



COTTA
HEAVY-DUTY
TRANSMISSIONS

"Engineered-to-order"



Acids, Beverages, Caustics, Dyes . . . everything goes in Stainless Steel tankers

*Cleanability of corrosion-resisting type 316 Stainless Steel
gives tank trailers great hauling flexibility*

Leave the home lot in the morning loaded with animal or vegetable oils, return in the evening with paint or varnish, and back on the road before daylight with a load of glue . . .

This is the kind of flexibility you can build into a tank trailer when you use type 316 Stainless Steel.

Its lasting resistance to corrosion means that many liquids—chemicals, foods, petroleum products—can be bulk transported in the same tanker. Usually, all that's needed to change

from one product to another is a quick, but thorough, cleaning job.


The corrosion-resisting quality of type 316 Stainless also boosts the service life of the tanker. One motor transport company reports that they bought their first stainless steel tanker 20 years ago and it's still in service.

**Easy to fabricate . . .
economical to produce**

The nickel content of 316 Stainless

Steel not only enhances the metal's corrosion resistance and durability, but also gives it unusual ductility and weldability . . . makes possible fast, simple fabrication . . . economical production.

If you would like more information about the superior corrosion resistance and fabricability of 316 Stainless Steel . . . as well as the specific properties and characteristics, just let us know. We'll answer any specific questions you have.

The **INTERNATIONAL NICKEL COMPANY, Inc.**
67 Wall Street  New York 5, N. Y.

INCO NICKEL

NICKEL MAKES ALLOYS PERFORM BETTER LONGER

AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE • PUBLISHED SEMI-MONTHLY

JUNE 1, 1959

VOL. 120 No. 11

Features • • •

▼ Chevrolet Fenders Made at High Rate

The Budd Company's Hunting Park plant in Philadelphia has a setup for making 1959 Chevrolet front fenders at the rate of 850 per hour. This unusually-high output is produced by continuous-line operation from start of forming—including assembly—to shipping. Page 30.

▼ Overhead Conveyors Used for Assembly

Cadillac Motor Div. has discarded prior floor-type flat-face conveyors and adopted special overhead conveyors for assembly of certain parts. Three different closed-loop systems of the latter type have been installed for assembly of upper and lower instrument panels, and front and rear bumpers. Page 36.

▼ GE's New Aircraft Gas Turbine

General Electric Company's latest gas turbine engine, designed for application in military helicopters as well as propeller-driven aircraft, delivers 2650 military shp with a specific fuel consumption of 0.506. Designated the T-64, it comes in two powerplant versions—a turboshaft model and a turboprop model. Page 39.

▼ Mechanized Handling of Bumper Bars

An important step that promises economy is mechanization of press lines—in loading blanks and stampings in process, and in unloading stampings and advancing them to the succeeding operations. Here is how it is functioning in Chevrolet's spring and bumper plant at Livonia, Mich. Page 40.

▼ Gears Produced on Automatic Line

At Ford's Sharonville, Ohio, plant, production of automatic transmission parts is handled by highly-automated equipment. This article, the third in a series, describes the manufacture of planet gears on a completely-automatic line. Page 42.

▼ Material Handling Exposition

Slated for Cleveland on June 9-12, the Material Handling Exposition of 1959 will present many of the newest developments in the art of material handling. Previewed in this issue are typical examples of the hundreds of products to be displayed, together with the program for the concurrent technical sessions. Page 48.

▼ 45 New Product Items, And Other Features, Such As:

Metals report, news of the machinery industries, automation news report, and industry statistics.

... continued on next page

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 NBP National Business Publications, Inc.

 ABC Audit Bureau of Circulations

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People Love It



FROM NEW YORK: "All four of my brakes are always perfectly adjusted whether I'm on the thruway or driving in bumper-to-bumper traffic in the city."

FROM ATLANTA: "Knowing our brakes are never out of adjustment gives me a wonderful safe feeling. I'm at ease even when taking the children to school."



FROM DENVER: "There's new pleasure in mountain driving now that I know my brakes always have maximum stopping power."

FROM MINNEAPOLIS: "In all kinds of weather, self-adjusting brakes give me stopping power at its best—and save the cost of brake adjustments."



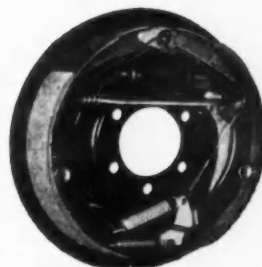
AGAIN . . . BRAKES ARE NEWS IN DEALERS' SHOWROOMS!

Bendix* Self-Adjusting Brakes give dealers a double-barreled sales appeal: safety plus economy. And those in close touch with today's market know that these two appeals—safety and economy—are among the most powerful sales points that can be made to the American buying public.

Car prospects quickly realize that there's real safety in always maintaining the brakes at maximum stopping power. And the obvious savings that they make by eliminating the expense and bother of periodic brake adjustments. What's more, with all

brake shoes always correctly adjusted, there's always the right clearance between pedal and floor. And that's a feeling any car buyer appreciates.

Reasons like these make self-adjusting brakes a good "talking piece" for dealers. It won't be long before car buyers everywhere will know about self-adjusting brakes—and want them. But this latest advancement in brakes joins power brakes and power steering as examples of how Bendix pioneers and develops improvements to meet the needs of the automobile industry.



When shoe clearance exceeds a predetermined amount, a ratchet sets up the star wheel adjuster one notch—as the brakes are applied when the car is in reverse. This automatically adjusts the shoes to exactly the right fit within the drum and compensates for lining wear.

*REG. U. S. PAT. OFF.

Bendix PRODUCTS DIVISION **South Bend, IND.**

Circle 106 on Inquiry Card, for more Data

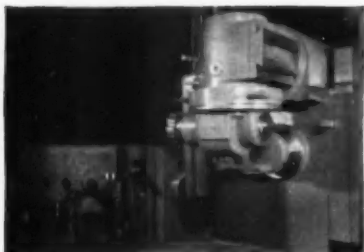


SUNDSTRAND



"ENGINEERED PRODUCTION" NEWS

Universal Bed Type Rigidmil Combines Flexibility with High HP in Cutting Costs on Large Work



Machining end of work piece is illustrated in this example using all angle head in horizontal position and vertical feed.



Machining on top of the work is illustrated in this example using the All Angle head and longitudinal table feed.



All angle head is used to mill clearance cuts at an angle using transverse feed. All power feeds are infinitely variable.



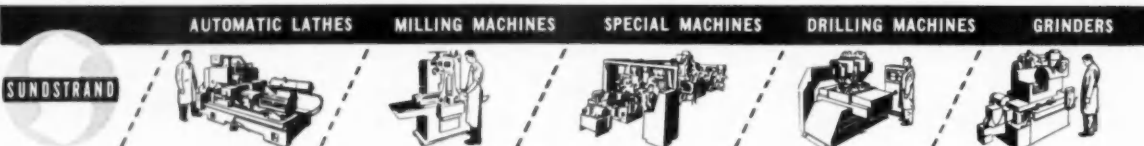
Horizontal spindle and longitudinal table feed are used for face milling first surfaces of large casting.

Because this universal bed-type Rigidmil milling machine was able to machine a total of 28 surfaces on this large, heavy casting in just two setups, sizable savings were effected through a reduction in handling and setup times. Production is not sacrificed to gain flexibility as both the horizontal spindle and the all angle head have the horsepower needed for heavy cuts using carbide cutters, 50 and 20 hp respectively.

Positioning the cutter instead of the work, eliminates special fixtures needed to machine complex angles on conventional machines, and reduces set-up time. Accuracy standards invariably exceed those possi-

ble on other machines because of the reduction in workpiece handling. Machine has a table feed stroke up to 216 inches, transverse feed stroke of 24" and vertical feed stroke of 26" making possible machining on large work pieces. Pushbutton pendant control of all machine speeds and movements enables the operator to keep close control over every type of job.

In addition, slab milling can be performed with the main spindle by mounting an arbor support on the dovetail ways provided. An extra cost option is a power operated draw rod for the horizontal spindle that simplifies cutter change.



Steering Gear Part Thread-Milled in Automatic Setup

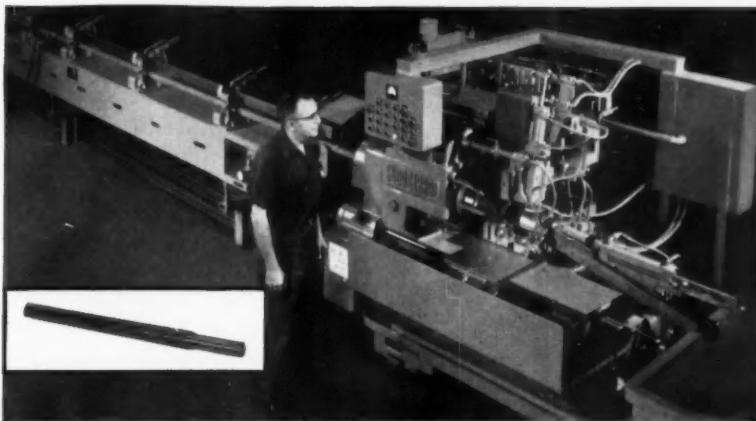
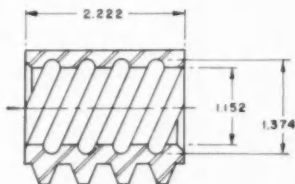
A two pass operation that leaves minimum stock to be removed in a following finish-grinding operation is used to produce approximately 72 ball nut components per hour on this Sundstrand Hanson-Whitney thread milling machine. Material is SAE 5120 steel.

Because of the limiting physical dimensions of the cutter (small diameter in relation to length) a rough cut and finish cut are made to hold stock to a minimum for final grinding operations. Both rough and finish cuts are in one automatic cycle.

The completely automatic cycle, including load and unload, permits the operation to be handled with minimum operator skills and allows one operator to handle several machines.



Hanson-Whitney 10 x 24 inch machine built by Sundstrand equipped for automatic production, including load and unload, of automotive component. Principal dimensions of ball nut unit are shown below.



Hopper-Fed Sundstrand Lathe Turns 450 Shafts Per Hour

A special hopper arrangement for automatic feeding of bar stock to permit continuous cycling helps this Model 6A Sundstrand Lathe set a fast production pace. Fractional horsepower motor shafts are turned at an average rate of 450 per hour with lengths of finished shafts ranging from 9 to 13 inches.

Bar stock is fed automatically thru the spindle; is cut to length, turned, and grooved; and is automatically

ejected onto the conveyor at the completion of the machine cycle. Front, rear, and overhead tools are provided to reduce machining time. Because production requirements change frequently, quick setup tooling using micrometer tool blocks and stops is used. Not only does this permit reduced change-over time but it also eliminates the need for trial cuts at the start of a new production run.

Ceramic Tooling Keeps Brake Drum Output High

Combining ceramic tooling with the modern design features of the Sundstrand vertical lathe has opened the way to new highs in production efficiency on this brake drum turn-

ing operation. Hourly production is now at 72 units per hour at 80% efficiency, at nearly double the surface speed used with carbides. Surface finishes exceed any previously attained, eliminating the need for a sanding operation formerly required.

Easy loading and unloading made possible by the vertical lathe design play an important role in the increased production rate. Open front vertical machine makes it easy to provide automatic chip disposal, an important advantage in view of the high rate of metal removal.

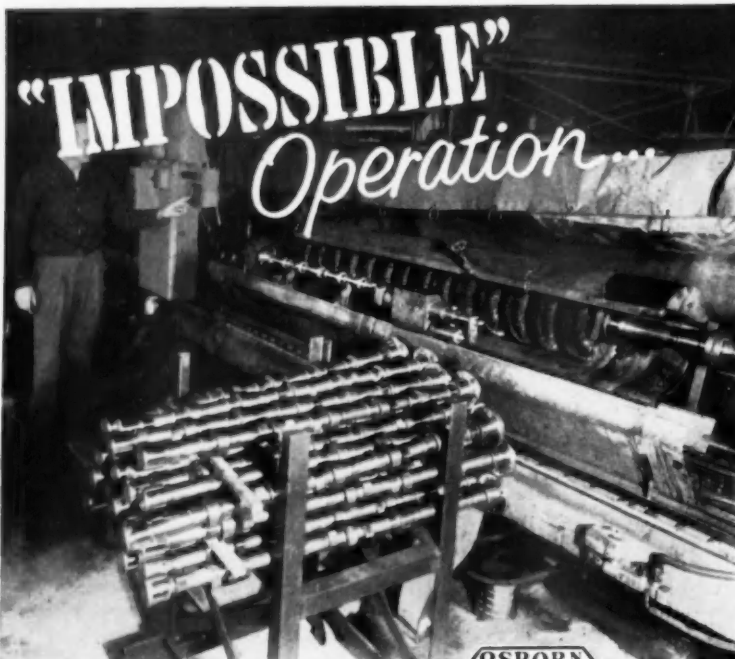


Learn more about how Sundstrand "Engineered Production" can solve your machining problems by writing for Bulletin 204 today.

BROACHING TOOLS BROACHING MACHINES PRESSES



SUNDSTRAND
MACHINE TOOL
Div. of SUNDSTRAND CORPORATION
Belvidere, Illinois • U. S. A.



POWER BRUSH CAMSHAFT FINISHING SETUP was designed and built by Universal Camshaft Co., Muskegon Heights, Michigan. It incorporates lathe bed, air cylinder, 50 hp motor and a gang-unit of 14 Osborn Disc-Centers brushes. Operation deburrs cams and cleans plating chips from steel shafts automatically.

UNTIL OSBORN POWER BRUSHING tackled this camshaft finishing job

This manufacturer had been finishing steel camshafts by a slow, costly off-hand method that resulted in pitted shafts and inconsistent deburring... high scrap loss. It looked like an "impossible" operation to improve.

But, today—using this ingenious power brushing method developed by the manufacturer's engineers and an Osborn field specialist—the job is done rapidly, economically with extremely high quality output.

An operator simply loads the steel shaft into a fixture. The Osborn Disc-Center® Brush unit drops against the work at pre-set pressure and time cycle... also reciprocates back and

forth along the shaft. This action allows deburring cams of various type steel shafts *without* re-spacing the brushing unit. Plating chips are thoroughly cleaned from the main shaft at the same time.

With modern Osborn Power Brushing—this "impossible" job became a high-output, low-cost, quality-controlled operation.

An Osborn Brushing Analysis—made in your plant at no obligation—can pinpoint new savings and better finishing methods for you, too. Write us for details. *The Osborn Manufacturing Company, Dept. E-77, Cleveland 14, Ohio.*



POWER, PAINT AND MAINTENANCE BRUSHES • BRUSHING METHODS
BRUSHING MACHINES • FOUNDRY PRODUCTION MACHINERY

CALENDAR

OF COMING SHOWS AND MEETINGS

- 10th Annual Industrial Research Conference, sponsored by Columbia University, Dept. of Industrial and Management Engineering, Arden House, Harri-man, N. Y. May 31-June 5
- Fifth World Petroleum Congress, Coliseum, New York, N. Y. May 31-June 6
- Third Annual Summer Conference on Vacuum Metallurgy, New York University College of Engineering, University Heights, Bronx, N. Y. June 1-3
- Institute of Management Sciences, American national meeting Pick-Congress Hotel, Chicago, Ill. June 4-6
- American Petroleum Institute Div. of Production, midyear committee conference, Brown Palace & Cosmopolitan Hotels, Denver, Colo. June 7-12
- Material Handling Institute Exposition, Public Auditorium, Cleveland, O. June 9-12
- Pressed Metal Institute, national sales seminar for metal stamping industry, Bedford Springs Hotel, Bedford, Pa. June 11-12
- Manufacturing Chemists' Association, 87th annual meeting, The Greenbrier, White Sulphur Springs, W. Va. June 11-13
- International Conference on Powder Metallurgy, Hotel Biltmore, New York, N. Y. June 13-15
- ASME Semi-Annual Meeting, Chase-Park Plaza Hotels, St. Louis, Mo. June 14-18
- SAE Summer Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J. June 14-19
- Institute of the Aeronautical Sciences, summer meeting, Ambassador Hotel, Los Angeles, Calif. June 15-18
- 5th Industrial Finishing Exposition, sponsored by American Electroplaters Society, Detroit Artillery Armory, Detroit, Mich. June 15-19
- Twentieth Annual Management Course, College of Engineering, State University of Iowa, Iowa City, Iowa June 15-27
- Industry Missile and Space Age Conference, sponsored by Michigan Aeronautics and Space Association, Sheraton-Cadillac Hotel, Detroit, Mich. June 16-17
- Annual Industrial Engineering Seminars, Dept. of Industrial and Engineering Administration, Sibley School of Mechanical Engineering, Cornell University, Ithaca, N. Y. June 16-19
- 2nd Nuclear Instrumentation Symposium, sponsored by Instrument Society of America, Idaho Falls, Idaho June 17-19
- ASME Applied Mechanics Division Conference, Virginia Polytechnic Institute, Blacksburg, Va. June 18-20
- American Society for Testing Materials, 62nd annual meeting, Atlantic City, N. J. June 21-26
- Air Pollution Control Association, Hotel Statler, Los Angeles, Calif. June 22-26
- Society of Plastics Engineers, Inc., Detroit Section, regional technical conference, Sheraton-Cadillac Hotel, Detroit, Mich. June 30

UDYLITE GOES ALL OUT . . .

to make your 1959 AES Convention memorable

THIS IS A DOUBLE INVITATION . . . BE OUR GUEST AT THE CONVENTION . . .



Jeanne Darr,
singing comedienne

JOIN US AT THE UDYLITE HOSPITALITY CENTER for Cocktails on Monday, Tuesday and Thursday, June 15, 16 and 18 from four to six p.m. . . . Michigan Room of the Statler Hilton Hotel, Detroit. Entertainment will feature Jeanne Darr and Elena Santa.

BE SURE YOU DO NOT MISS THE UDYLITE-AES BALL . . .

in the beautiful Terrace Room of the Statler Hilton, Thursday evening June 18, 10 P.M. to 2 A.M. Rollicking entertainment will be supplied by the Fenby-Carr quintet known across the country as the Singing Schoolteachers. **BE THERE!**



Fenby—Carr quintet

AT THE EXPOSITION . . .

See Udylite's exciting and unusual display, a truly unique presentation of the most complete and advanced developments in equipment, supplied and services . . . graphically displayed in a manner that will put you "right on top" of the metal finishing picture. Here presented in a striking manner and full of surprises is an entire industry—on Parade.

LIVE ACTION • POWERFUL DEMONSTRATION COMPLETE—DETAILED

Mr. Executive:

Learn about the latest developments in modern metal finishing . . . see Udylite!

P. S. Make sure your staff sees this, too.

**AT THE
AES CONVENTION
and EXPOSITION for 1959
DETROIT, MICHIGAN
JUNE 15 THRU 19
STATLER HILTON HOTEL
DETROIT ARTILLERY ARMORY**

world's largest plating supplier



More horsepower for the new Caterpillar D8 tractor



AIRESEARCH
T-1404
TURBOCHARGER

Turbocharger system specifically designed for big Series H tractor

A joint development of Caterpillar and AiResearch, the turbocharger system is an integrated part of the new D8 Series H tractor. Extensive field tests showed an increase of 20% in bulldozing and a substantial gain in pushloading production with the Series H...brought about by the

tractor's greater horsepower, faster torque rise, greater weight and faster dozing and reverse speeds.

Specifically designed to match the new tractor's requirements, the new turbocharger underwent thousands of test hours on the new D8 operating in every kind of material on every kind of job.

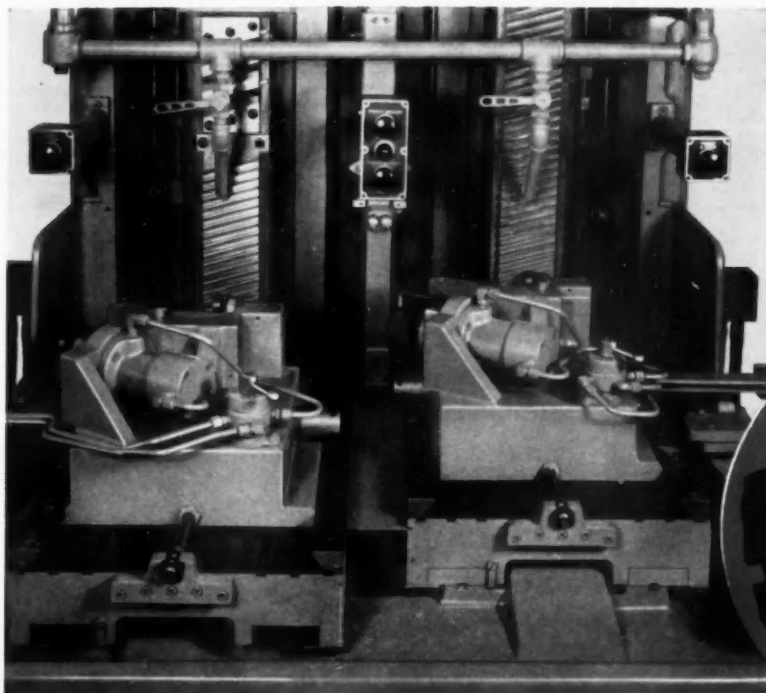
AiResearch turbocharger advantages include: increased horsepower, improved lugging ability, cooler exhaust temperatures, reduced maintenance costs, less smoking and noise. This is another application of AiResearch turbochargers to heavy industrial machinery.



AiResearch Industrial Division

9225 South Aviation Blvd., Los Angeles 45, California

DESIGNERS AND MANUFACTURERS OF TURBOCHARGERS AND SPECIALIZED INDUSTRIAL PRODUCTS



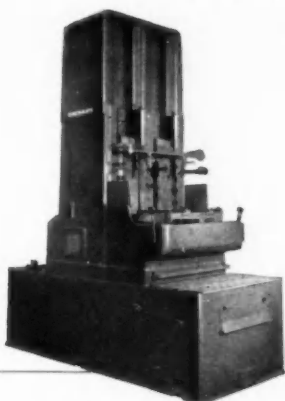
PRODUCTION DATA:

Part name . . . Servo body
 Material Cast iron
 Operation . . . Broach large flat surface
 Stock removal .100"
 Production . . . 278 per hour
 Machine CINCINNATI No. 10-66
 Duplex Vertical
 Hydro-Broach



CINCINNATI DUPLEX VERTICAL

. . . Broaches Smooth Accurate Surface on Servo Valve Bodies



CINCINNATI No. 10-66 DUPLEX VERTICAL HYDRO-BROACH MACHINE

Cincinnati builds three complete lines:

Single Ram Vertical Hydro-Broach . . . Catalog No. M-1745-1

Duplex Vertical Hydro-Broach . . . Catalog No. M-1848-1

Horizontal Hydro-Broach . . . Catalog No. M-1910

Specifications for servo bodies are tough. For example, the large joint face must be surface-plate flat, and machined at a high rate of production. To meet these requirements, Cincinnati Engineering Service Specialists recommended broaching, and tooled up a CINCINNATI No. 10-66 Duplex Vertical Hydro-Broach for the job. Two hydraulically operated fixtures help the operator maintain high production. The machine's smooth ram traverse, square gibbed ways, automatic pressure lubrication and other features take care of the accuracy of flatness requirement.

CINCINNATI Hydro-Broach Machines and Cincinnati Engineering Service are a team that just can't be beat for modern, low-cost production methods and equipment. Why not take advantage of this team? Send your blueprints and details, or write for catalogs.

Special Machine Division, The Cincinnati Milling Machine Co.
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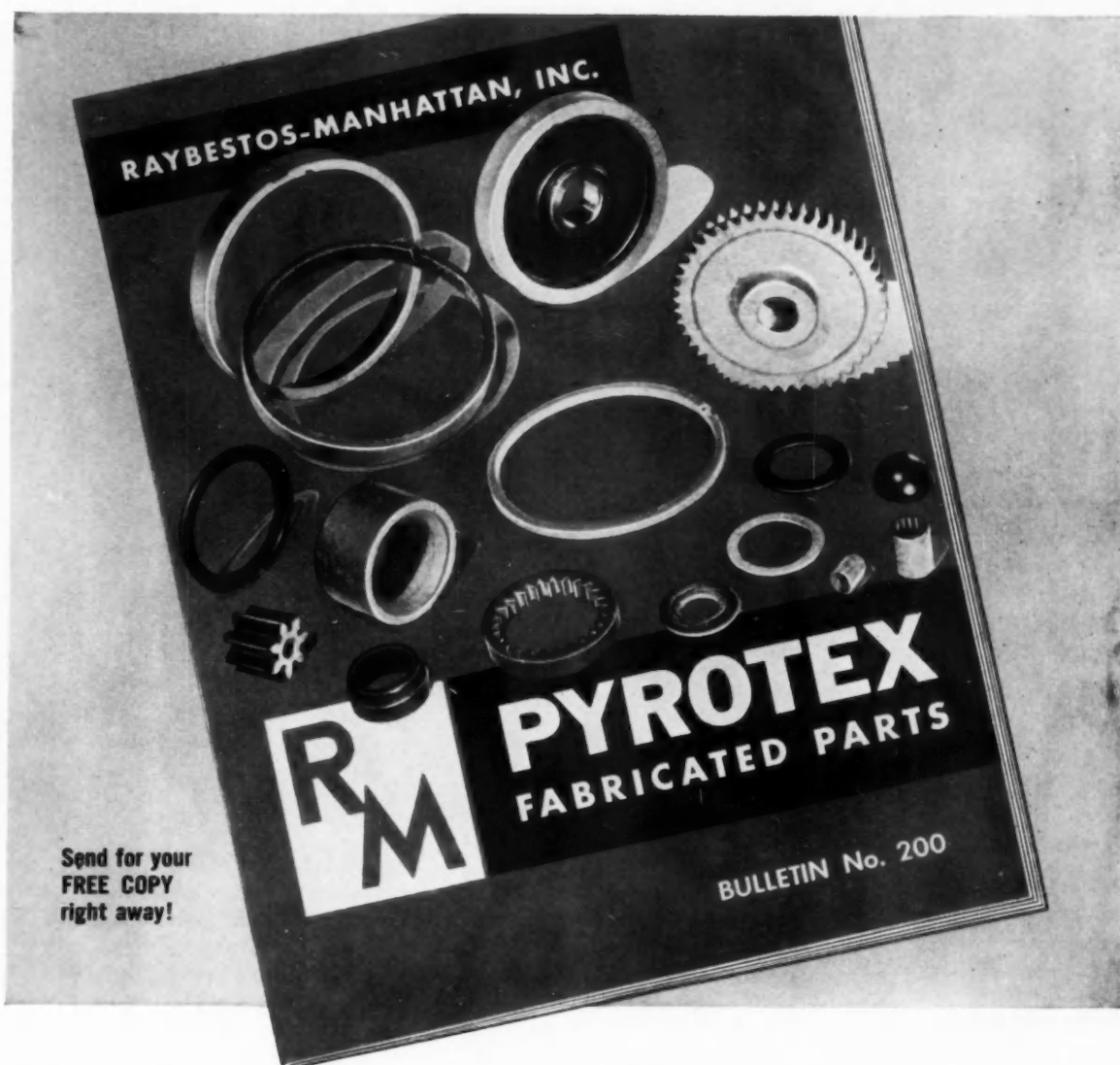
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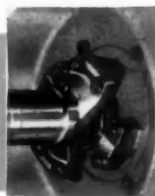


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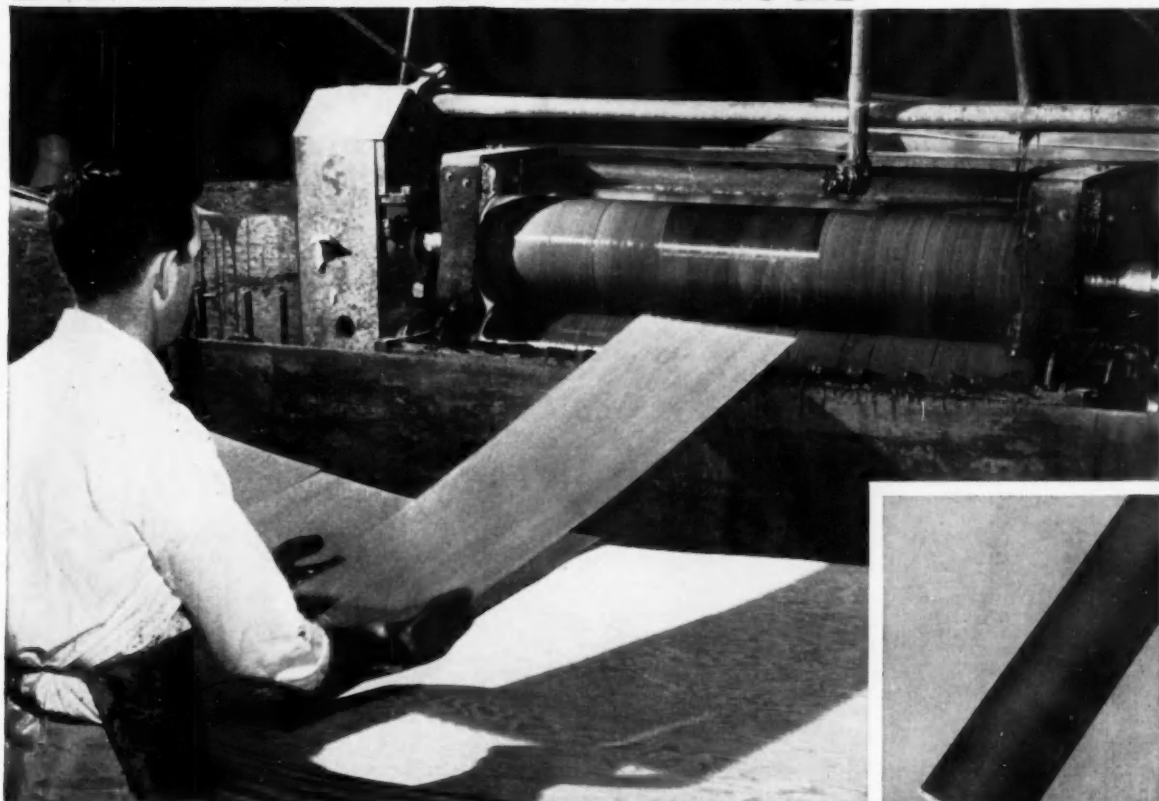


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News

OF THE AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 120, No. 11

June 1, 1959

GM MAKES IT OFFICIAL: SMALL CAR DUE IN FALL

Ford, Chrysler Plans Confirmed

General Motors Board Chairman, Frederic G. Donner, has made it official: GM will market its small Corvair passenger car in the fall.

In confirming GM's intention to build a small car, Donner ended long press and public speculation on "will they or won't they." He made his announcement May 22 at GM's annual shareholders' meeting in Wilmington, Del.

Donner said the Corvair will be built at Willow Run, Mich., and Oakland, Calif. The rear-engine car will have a 108-in. wheelbase. The aluminum block engine, a flat six, will be built at Tonawanda, N. Y. (AI March 1, p. 11).

All of the Big Three auto makers now are committed to enter on a full scale the growing market for cars defined variously as "small," "economy," "compact," "convenient," etc. All three companies have been offering foreign-made cars in this country on a limited-dealer basis.

Ford and Chrysler Plans

Ford and Chrysler made their small car intentions public last March (AI April 1, p. 15). Henry Ford II said that "barring changes in the market and other circumstances, the company plans to introduce such a car during the 1960 model year." He repeated his statement at the company's stockholders' meeting in Detroit May 21, adding that the car will be called the Falcon.

And on that same day Chrysler president, L. L. Colbert, confirmed his intentions when he announced that the Valiant will be introduced in the fall as a separate Chrysler Corp. passenger car line.

Latest reported dates for announcement (subject to change, of course)

are Oct. 9 for Chevrolet's Corvair, Oct. 16 for the Falcon.

Model Lineup

Corvair will come in one model only—a four-passenger sedan. Ford's Falcon will include four-door and two-door sedans, and four-door and two-door station wagons. The Valiant will come in a four-door and two-door sedan, and a four-door station wagon. Overall length for the Corvair is 180 in., the Falcon sedan, 181 in., the Valiant sedans 183 in.

Ford has not revealed officially where its Falcon will be built, but a Ford industrial relations man reportedly confirmed to UAW Local 600 that the car would be built in Lorain, O.

and the engine in Lima, O., as predicted by AI May 15, 1958. The union local had protested Ford's decision to build the car in another plant city.

Chrysler Tilts Engine

Chrysler Corp. will tilt the engine in its forthcoming Valiant small car 30 deg from vertical to save room in the forward engine compartment.

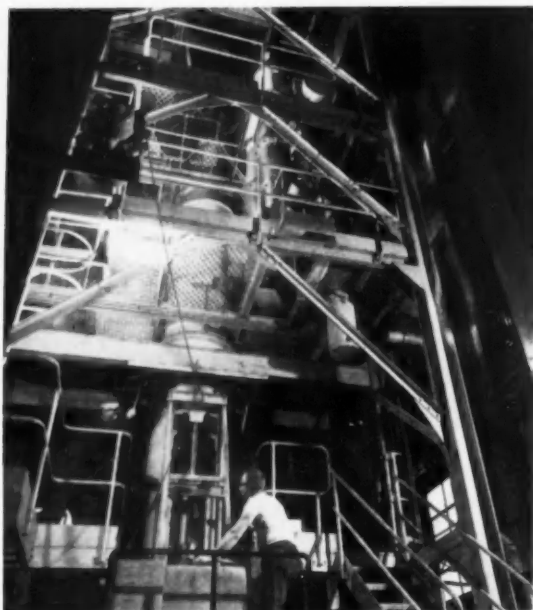
The unconventional tilt will permit some further unconventional positioning of engine accessories. Some of the relocation is for space economies, while one result reportedly is a 10 per cent increase in engine power.

The ohv engine will be tilted to the right side of the car, leaving more room on the left side of the engine. This is where the water pump carburetor and intake manifold will be lo-



VOLVO TO UNVEIL NEW SPORTS COUPE

This new Volvo sports coupe will be introduced in Sweden sometime this year and offered on the American market in late 1960. The new addition to the Volvo family is 51 in. high and has an overall length of 173 in. No price has been announced as yet.



VACUUM MELTING FURNACE

This new consumable electrode vacuum melting furnace was installed by Vanadium-Alloys Steel Co. at its Latrobe, Pa., plant. The furnace, part of a \$3.5 million expansion program, will produce up to 4 million lb a year. It uses a German-developed system of arc control and a pumping network designed for nearly complete vacuum.

ated. Net result is a 1½ in. saving on overall engine length.

Extra long "tuned" leads from engine ports to the intake manifold are said to boost engine power by as much as 10 per cent.

The Valiant, incidentally, was planned originally as an aluminum engine car. Chrysler has not been able to perfect the engine in time for initial production, however, so the first cars off the line will have cast gray iron blocks.

Chrysler had hoped to be able to push through the aluminum program in time, and consequently most of the tooling is on hand. A running change was planned to come after 12,000 units. Whether the change is made that soon is doubtful.

Either way, aluminum or gray iron, the engine will be a six-cylinder, in-line ohv with 170 cu in. displacement, as reported earlier by AI.

Cincinnati-Nederland Plans Expansion of Plant and Line

Cincinnati-Nederland N. V., a subsidiary of Cincinnati Milling Machine Co., is planning to expand its plant facilities and product line. The move is designed to meet the growing needs of the Dutch market as well as the Common Market, and to improve customer service.

The expansion at the Vlaardingen plant will include additions to the machine shop and assembly areas, training facilities, and sales and engineering offices.

Cincinnati-Nederland builds center-type and centerless grinders, cutter and tool grinding machines, and milling machines.

Truck Market Is Booming — See Possible Model Shortage

The domestic truck market is booming. Production is running some 30 per cent ahead of last year.

If the present surge continues, some dealers are predicting that a model shortage will develop before the end of the year.

Through mid-May, the industry built 483,457 trucks. A year ago, the total was only 343,832. Some individual makers had increased their output even more—Chevrolet 158,533 against 114,966, or Ford 130,817 against last year's 88,690.

At Chevrolet, sales through April were approximately 100,000 units. This division recently increased its production schedules through the end of the model run, and a shortage still was predicted for many Chevrolet models.

At Ford, April sales were 61 per

cent over April, 1958, and 7 per cent over March, the previous high month. May production schedules were increased 13 per cent over plan.

Other examples: Willys ahead of last year by 14,400 units; Dodge production a full 50 per cent over 1958; International's output of 54,765 topping last year by 14,700 trucks.

Israel to Enter U.S. Market With Station Wagon and Van

Israel is the latest country to make a bid for a piece of the growing economy car market in the U. S.

The latest entry in the economy car sweepstakes is the Sabra, which comes in two models—a station wagon and a delivery van.

The Sabra is powered by a four-cylinder engine, has an 85-in. wheelbase, and overall length of 136 in.

The Sabra is built by Auto Cars Co. Ltd. of Haifa, and will be distributed by American Israel Corp. of New York City. Prices have not been announced.

Meanwhile, passenger car imports into the U. S. continued to mount, according to the Automobile Manufacturers Association.

In March, foreign car imports rose to 54,184 from 47,126, the previous month. Dollar value of the imports totaled \$62,220,845, compared with \$52,695,441 in February.

For the first quarter of 1959, the AMA reported, imports totaled 153,329 for a dollar value of \$175,276,543.

Chrysler Revamps Cycleweld As Chemical Products Div.

Chrysler Corp. has revamped its Cycleweld Cement Products Div. and changed its name to Cycleweld Chemical Products Div. Sumner B. Twiss was named president.

Under Dr. Twiss Cycleweld's product line will be broadened and a new line of chemical products for the retail consumer market will be added.

Cycleweld produces adhesives, sealers, and petrochemical products for automotive, aircraft, marine, and general industrial users.

C. B. Gorey, group executive-special products, said the appointment of Dr. Twiss is a major move to accelerate development of new Cycleweld products and to strengthen the division's sales organization.

Dr. Twiss joined Chrysler in 1946 in the Engineering Div., later became head of the Physical-Chemical Research Dept.

GM Will Return to 'A-B-C' Bodies with 1961 Models

General Motors will abandon the single body concept at the end of the 1960 model year and return to its 'A-B-C' system for 1961.

At present, all five GM passenger car lines share the same basic body shell. Wheelbases range from Chevrolet's 119 in. to Cadillac's 130 in. (except for the limousine), and overall lengths range from 210.9 in. to 225.4 in. But the stretch comes in increased front overhang, rear underbody sections, rear quarter sections and decks.

The controlling factor is width. Current GM body shells have the same basic width at center post exclusive of hardware and exterior trim. Divisions can make their cars longer, can make rear door openings wider, can make trunks roomier. But they can't make their cars any wider, or narrower, than the standard.

But in 1961, the corporation will return to three bodies or, as some say, two and one-half bodies. They will line up as follows: Chevrolet and small Pontiac on the A body; big Pontiac, small Oldsmobile and small Buick on the B body; and big Oldsmobile, big Buick and all Cadillacs on the C body.

One Detroit group contends that the C body actually will be a B+ body, or a B-and-a-half. This, again, is a matter of sheet metal stretch.

The reason for the change is obvious. Many GM customers and dealers are not happy with the similarity of size of the various 1959 GM lines. The A-B-C system provides divisions with more freedom in designing and engineering individual models.

First tooling for the 1961 bodies is expected to be released in the Detroit area next September.

Central Foundry Uses Plutonium To Measure Sand Mold Moisture

Central Foundry Div. of General Motors is using plutonium-239 to measure moisture content of molding sand in what is believed to be the first industrial application of its kind.

Division general manager James H. Smith says the new gage permits Central Foundry to maintain a more exact moisture content than ever before. Accuracy is better than $\pm .05$ per cent by weight over a range of 2.5 to 5.0 per cent total moisture content.

Here's the way the gage works:

A stainless steel capsule containing 32 grams of plutonium mixed with beryllium powder is lowered into the

center of a 3200 lb batch of molding sand. Fast neutrons emitted by the plutonium collide with hydrogen nuclei in water atoms in the sand, producing slow neutrons.

The slow neutrons are counted electronically by two neutron counters in the source tube. Number of slow neutrons is directly proportional to the sand's moisture content. The count reveals the percentage of existing water in the sand and the amount of water to be added by the operator.

The gage was developed and built by Harvey A. Burley, John P. Dandorh, Robert E. Black and Arthur Block of the GM Research Laboratories Physics Dept. Milton J. Diamond, research engineer for Central Foundry, suggested the plutonium counter.

Mobile Laboratory Given To U of Michigan by Inco

A mobile laboratory for on-the-road studies of motor vehicle performance now is in operation at the University of Michigan's College of Engineering.

The unit is a gift from International Nickel Co. and several manufacturers.

The rolling laboratory is equipped with 20 instruments to study everything from intake manifold absolute pressure to deceleration and brake pressure. Possible studies include fuel consumption, volumetric efficiency of engine, wind velocity and direction, total used current in amperes, and exhaust gas and smog-producing tendencies.

The laboratory is a 27 ft GMC coach, restyled at the Mitchell-Bentley Corp. Ionia Manufacturing Div.

Some of the instruments included are a fifth wheel speedometer; fifth wheel stopping distance recorder; oscilloscope; electronic event counter for rpm, wheel revolutions, prop shaft revolutions, etc.; engine speed indicator; fuel burette; wind direction and velocity meters; and a sintered plate nickel-cadmium battery for sub-zero starting.

A one-cylinder four-cycle auxiliary gasoline engine supplies power for the air conditioner compressor motor, condenser fan motor and oscilloscope.

Although Inco was the principal contributor, the project also was aided by Lyon, Inc.; Friez Instrument Div., Bendix Aviation Corp.; Stainless and Strip Div. of Jones & Laughlin Steel Corp.; United States Rubber Co.; and GM's Styling Staff, Engineering Staff, Proving Grounds, Truck and Coach Div., Harrison Radiator Div., and Frigidaire Div.

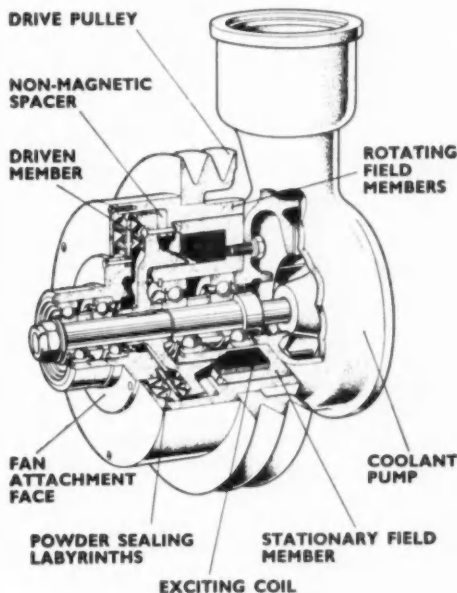
India Takes Steps to Promote Production of Cars and Trucks

The government of India is taking steps to promote the manufacture and sale of automotive vehicles.

A new federal agency, the Development Council for Automobile Industries, is mapping plans to stimulate use of passenger cars, trucks, motorcycles, autorikshahs, and three-wheelers. Specific recommendations for growth of the Indian automotive industries are expected to emerge from the Council soon.

MAGNETIC FAN COUPLING

Magnetic particle fan coupling is made in England by Smiths Motor Accessories Division. It comprises a stationary field member of annular C-section containing the exciting coil; a rotating field member carrying the drive pulley; and a driven member mounting the fan. The ferrous powder is retained by sealing labyrinths in two small radial gaps between the rotating field and the driven member. When the coil is energized by the thermostat in the base of the radiator, the magnetic flux solidifies the powder, which then locks the input and output sections together to operate fan.





New Diamond T Diesel series has 50-in. tilt-cabs

New Diesel Truck Series Features 50-in. Tilt-Cab

Diamond T Motor Truck Co. announced a completely new Diesel series featuring a 50-in. aluminum tilt cab.

The new series, designated 931C, was designed for reduced chassis weight and to permit use of maximum length trailers. Bumper-to-front axle is 28 in. Maximum GCW rating is 76,800 lb.

A variety of wheelbases is available. For two-axle vehicles, the basic wheelbase is 120 in., with optional wheelbases to 198 in. Six-wheelers with tandem drive axles are built in a range of wheelbases from 138 to 240 in.

The 931C offers a choice of five Cummins Diesel engines, developing from 180 to 262 hp.

Du Pont Sees New Automotive Applications for Plastics

A 300 per cent rise in automotive plastics use is predicted by Du Pont Co.

Plastics will replace many cast metal parts, resulting in a saving of about \$45 million over a five-year period, says Du Pont.

At present, plastics are used sparingly in cars. Total weight of the four general plastics—acrylic, nylon, fluorocarbon and polyethylene

—is slightly more than three lb per car, according to Du Pont. Acrylic resins are used at the rate of about 1.8 lb per car, nylon about ½ lb, polyethylene just under 1 lb and fluorocarbon resins only a slight fraction of 1 lb.

But within five years, says Dr. John D. Young of the Polychemicals Department's Plastics Sales Div., these will increase to about two lb of acrylics, a 40 per cent increase in polyethylene per-car consumption, a 10-fold increase in fluorocarbon use and a 300 per cent increase in nylon.

And to this should be added an average per-car consumption of about two lb of Delrin acetal resin, just coming on the market, says Dr. Young.

Du Pont maintains that plastic producers have two advantages over their metalworking competitors. The injection molding of plastics eliminates many—and often all—of the costly finishing processes required for other materials, and the plastic part usually is ready for service when it leaves the mold.

The second advantage, according to Dr. Young, is that plastic engineering often makes it possible to eliminate many components required in a conventional design—total number of parts in a redesigned mechanism can be reduced by 50 or 60—and sometimes 90—per cent.

Here are some of the future pos-

sibilities for automotive applications of plastics, as outlined by Du Pont:

Delrin acetal resin: air suspension control valve, steering column housing, carburetor components and instrument cluster housings.

Zytel nylon: radiator fan, oil pump, timing gears and fuel lines and fittings.

Teflon fluorocarbon resin; transmission seals and ball joints; acrylic resin front grille.

Some of these predicted applications are expected to show up on 1960 car models.

Ford Officials See Good Windup to 1959 Car Sales

Two Ford Motor Co. officials forecast a strong finish to the 1959 car sales year based on current good retail sales and continued expansion of the nation's total economy.

George P. Hitchings, manager of the economic analysis department, reaffirmed his earlier prediction of a six million car year in 1959. He also predicted that new truck sales would return to their 1956-57 levels.

C. R. Beacham, Ford vice-president and Ford Div. assistant general manager, predicted total industry sales in the current quarter will top last year by 35 per cent and sales in the third quarter will be 40 per cent ahead of last year.

Beacham went a step further, predicting fourth quarter sales will be "significantly better" than either 1957 or '58.

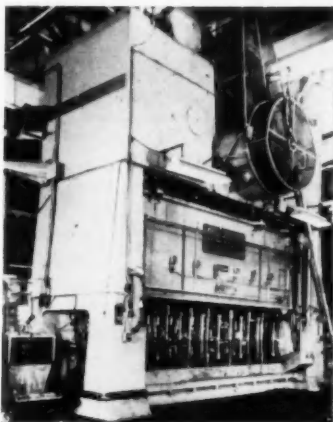
On a long-range basis, Beacham says the amount spent for new automobiles will rise to \$21 billion annually by 1965, up from \$15 billion spent in 1957.

Curtiss-Wright's New Air-Car Flies One Foot Above Ground

Curtiss-Wright has developed a flying passenger car that travels six to 12 in. above the ground over any type of unobstructed terrain. The "Air-Car" is powered by a conventional piston engine and employs an airplane-type propeller operating parallel to the ground.

Air flow from the propeller raises the Air-Car off the ground. Air flow also moves the car forward, suspended on the air cushion.

The car will be offered for sale by C-W, although specification details have not been worked out. A two-passenger model already has flown successfully, according to corporation president Roy T. Hurley. Mass-produced, he says, the car would cost no more than conventional automobiles.



BLISS 1500-TON PRESS

E. W. Bliss Co. engineers designed this 1500-ton press in conjunction with a transfer feed unit to speed up production of bearing cages at Timken Roller Bearing Co. plant. The press and transfer feed combination turns out 16 bearing cages per minute directly from automatically fed heavy-gage coil stock.

Firestone Tire Will Spend \$55 Million in Expansion

Firestone Tire & Rubber Co. will spend \$55 million over the next 30 months in a world-wide plant expansion program.

One new tire plant is planned for Alcochete, Portugal slated to go in operation later this year. Another plant, for synthetic rubber production, will be built adjacent to Firestone's butadiene plant at Orange, Texas.

Expansion and modernization programs are slated for tire plants in Pottstown, Pa.; Memphis, Akron, Des Moines, Los Angeles, and Hamilton, Ontario. Other plants scheduled for expansion are at Lake Charles, La.; Magnolia, Ark., and in Brazil, Argentina, Venezuela and India.

Goodrich President Predicts Record Tire Sales in 1959

Record industry sales of pneumatic tires are predicted for 1959 by E. F. Tomlinson, president of B. F. Goodrich Tire Co.

Tomlinson foresees unit sales of 115,345,000 tires, topping 1955's record by 1.1 million tires and last year by 10.3 million.

Passenger car shipments, including original and replacement, will total 94,675,000 tires for a new record, he says. Replacement sales for cars and trucks will rise 4 per cent above last year for a record of 76.7 million units.

AI TABLOID

National Bureau of Standards has devised a method of making a complete analysis of high-temperature alloys containing combinations of metals that belong to the same group of the periodic table and, hence, behave similarly. The new method consists of forming soluble metal complexes which can be separated on an anion-exchange column and retained for analysis.

U. S. Rubber Reclaiming Co., Inc., claims it has developed a chemical process for recovering nylon from wornout tires. Tests show, the company reports, the reclaimed nylon "is as good in quality as virgin nylon."

Standard Mirror Co. is producing a fender-mounted rear view mirror that is electrically controlled by a button on the instrument panel. The mirror can be aimed to suit the driver's height or to deflect headlight glare from cars in the rear by a touch of the button.

Large-scale plasma generators which will work by shooting electrons and ions through a magnetic field may be used someday to light whole cities, says Republic Aviation Corp. Electricity would be a "direct" product, eliminating the steam boilers, turbines, and heavy machinery used to generate power today. Republic has already begun experimenting in this field.

Volkswagen has decided to change the design of its car, which has remained fixed for some 20 years, according to a report by a leading German newspaper. Decision is said to have been sparked by increased competition arising from the Common Market.

An electronic device which "wires" a man for motion is the latest scientific tool used to study riding qualities in trucks at the General Motors Proving Ground. The rig, built by Chevrolet engineers, consists of a special seat and a headgear connected by wires to recording machines in the cab. As the truck moves, each motion of the driver's head and body is recorded on sensitized paper tapes.

A new spark plug with platinum electrodes lasts several times the life of the standard plug, says AC Spark Plug Div. of General Motors Corp. Designed originally for outboard motors and sports cars, the plugs have extra-long insulator tips, a platinum center electrode embedded in silver, and a fine-wire platinum side electrode.

Air Force has awarded a one-year contract to United States Testing Co., Inc., to study combined-environment testing compared with single-environment tests now in use. In the combined method, components are said to be subjected to tests more nearly matching actual conditions. Another advantage: test time and costs would be cut.

Army Engineer Research and Development Center is testing an airborne ditch digger said to be capable of digging a trench 4 ft deep, 24 in. wide at the rate of 12 ft per minute. The ditcher is capable of road speeds of 35 mph, and the digging mechanism is hydraulically retractable for road travel or air transport.

Lindberg Engineering Co. has developed a new type of metal melting line that is claimed to deliver a constant, uniform flow of almost chemically pure copper at a constant temperature. The refractory which contains the molten metal is entirely inert, Lindberg says.

A new instrument that records everything that happens to an aircraft in flight has been developed by a British firm. The device, which weighs about 40 lb, records on magnetic tape all data given on the mass of dials in a pilot's cockpit, plus pressures and fatigue on all parts of the airframe.

Martin Co. is using an infrared analyzer to locate fuel leaks during sealing of integral wing tanks. One operator injects nitrous oxide to outer wing surface. Gas follows leakage path to inner course, where it is detected by operator with a sniffing probe equipped with an actuating neon light.

AVIATION MANUFACTURING

Congress Moves to Renew Modified Renegotiation Act

Congressional support is growing for a tough, semi-permanent renegotiation act.

The powerful House Ways and Means Committee has just approved a four-year extension of the act, which expires June 30.

The Committee rejected industry arguments that more contracts should be exempted from renegotiation and higher profits allowed in order to spur industry expansion.

Under the new act, the U. S. Court of Appeals could review renegotiated contracts on appeal from rulings of the U. S. Tax Court. The appeals court could only uphold the Tax Court or send the case back for more study.

In addition, the Renegotiation Board would be required to give the contractor reasons for making its determination of "excess" profits.

Also for the first time, the Board would have to give the contractor any Government agency reports that had a bearing on the case.

A five-year carry-forward of losses on renegotiated orders would also be included. The present loss carry-forward is limited to two years.

The bill also clarifies such factors that bear on a decision as economies of production, and the relationship between company net worth and the amount of public and private capital used by the contractor.

New Microwave Tube Transmits Power to Flying Platforms

Raytheon Co. announced it has developed a powerful microwave tube, called Amplitron, that is capable of transmitting power through the atmosphere to flying platforms.

The power, in the form of high-frequency radio waves in the microwave region, would be beamed skyward in narrow paths from transmitters on earth. It would be collected by antennas on the platform and converted into heat energy to drive the craft's helicopter-type rotary wings.

The sky station would hover in a fixed position miles above the earth. It could be used as an early warning



GRUMMAN MOHAWK MAKES FIRST FLIGHT

Grumman Aircraft's YAO-1 Mohawk, a new Army observation plane, made its first flight recently. The Mohawk, a two-place plane, is powered by two Lycoming propeller engines (rated at 1005 eshp each), has a wing span of 42 ft, and overall length of 41 ft. Nine prototype models are now in production for the Army and another 35 planes will be built under a follow-on contract awarded earlier this year.

station or weather station, or as a link in a long-range communications network.

The platform also would be equipped with a supplementary chemical power plant to supply energy for vertical take-off and landing, and for emergency purposes.

The sky station concept was developed by a Raytheon team headed by Harold Hart and Dr. Harry Letaw, Jr., of the Government Equipment Div.

The Amplitron Tube was designed by an engineering team headed by William C. Brown, manager of the Microwave and Power Tube Div.'s Advanced Development Laboratory.

Goodyear Fuel Tank Can Take 30-G Wallop Without Bursting

Goodyear Tire and Rubber Co. announced it is producing a new fuel tank, called Safety Cell, that can take a 30-G wallop without bursting.

In a recent test, according to Goodyear, the new Safety Cell was slammed into a solid sandbag barrier at a speed near 100 mph, equal to a 30-G impact. The new tank, built of rub-

berized nylon, did not explode or shower its fuel, Goodyear said.

The Safety Cell tank is produced by Goodyear's Aviation Products Div. for the Army's YHC-1A and H-21 helicopters. Goodyear has been working with the Federal Aviation Agency's Technical Development Center for ten years to develop the tank.

GE Adds Turbofan Engine To Commercial Jet Series

General Electric Co. has added a new turbofan engine for short-to-medium range transport to its commercial jet engine series.

The new engine, designated CJ-810, will be in the 7000 to 9000 lb thrust class. It will be available for service in 1962.

Meanwhile, General Electric received \$29.3 million in contracts from the Air Materiel Command for further development of the J93 jet engine. This is in addition to an \$8.3 million contract for the J93 awarded the company in March.

The J93 will power North American Aviation's B-70 long range bomber and F-108 interceptor.

5-Million-Amp Arc to Drive Boeing Mach 27 Wind Tunnel

A hypersonic wind tunnel that will test models at Mach 10 to Mach 27 speeds is being built at the Boeing Airplane Co. plant in Seattle, Wash.

The tunnel's electrical system will include a giant capacitor bank to store 7 million Joules of energy. To drive the wind tunnel, the capacitor will discharge the energy in an arc of 5 million amperes.

The high-energy arc is discharged in a sealed chamber containing compressed air, raising the temperature and pressure up to 18,000 F and 30,000 psi. At these conditions, air is in plasma form—gas molecules are dissociated into separate, ionized atoms, having enormous kinetic energy.

The pressure bursts a diaphragm, sending shock wave, hypersonic air flow past the model in the tunnel's test section.

The energy storage bank will be charged with direct current from specially designed rectifier current. It will be charged to full capacity in about half a minute, but it will take only a few thousandths of a second to discharge.

Switching will be accomplished by an ingenious trigger arc created by vaporizing a small piano wire inside the arc chamber. Metal ions released by the vaporized wire make a path for the main arc, which will dump the entire capacitor bank charge of 7 million Joules in a few milliseconds.

The tunnel's electrical system was designed by General Electric Co's Industrial Engineering Section.

Huge Atomic Blimp Urged For U. S. Navy by Goodyear

An atomic-powered airship three times as large as blimps now in use by the Navy is proposed by Goodyear Tire and Rubber Co. and Goodyear Aircraft Corp.

Goodyear officials said the proposed airship was feasible and practical for modern-day military requirements. It could be in operation by 1963, they added.

Goodyear officials told an Aviation Writers Association meeting that the airship would be made of a new rubberized fabric capable of withstanding radiation exposures up to 100 million roentgens. The fabric is made of dacron cloth coated with adduct synthetic rubber.

The 4.5 million cu ft non-rigid airship would have a cruising speed of 70 to 80 knots and could reach any point in the world from U. S. bases, they said. It would be used for long-range anti-submarine patrols.



RYAN VERTIJETS TO GO ON WORLD TOUR

Two models of the X-13 Vertijet, built for the Air Force by Ryan Aeronautical Co., will go on an extended world tour. The model shown here rests on its utility ground trailer at Edwards AF Base. Air Force will display Vertijets at fairs, expositions, and air shows throughout the U. S., Europe, and the Far East.

The nuclear blimp would be 540 ft long. This would make it possible to place the atomic reactor far enough away from the control car to minimize radiation exposure to the crew.

Goodyear engineers said chemical fuel would be used for takeoff and landing. Once airborne, the craft's nuclear-powered turboprop engines would take over.

Republic Gets Study Award For Pinch Plasma Engine

Republic Aviation Corp. has received contracts from the Navy and Air Force totaling \$193,000 for advanced research on a magnetic pinch plasma engine.

Republic officials said that work under the contracts would be carried into 1960. The company expects that major problems of the engine can be solved by that time and a production model built by 1964.

The engine, according to Republic, would turn a heavy gas like oxygen into ions and electrons. These are compressed in an invisible cylinder of magnetism and shot out the rear at tremendous velocity.

The new contracts will enable the company to probe the technique of cycling these pinches for continuous operation, much like the cylinders of an automobile engine are cycled. Investigators will also study the possibility of obtaining power by magnetically pinching a combustible fuel, Republic said.

Corning Gets Award to Build Pyroceram Radomes for Navy

Radomes made of Pyroceram, new glass-ceramic materials, will be produced for the Navy's Tartar missile, a ship-to-air weapon.

A contract for production of the radomes was awarded to Corning Glass Works by Convair, a division of General Dynamics Corp. This is the first order for full-scale production of Pyroceram radomes, Corning said.

Corning recently installed radome finishing machinery at its Corning, N. Y. plant. The machine tools were obtained under equipment contracts awarded by the Navy.

Pyroceram is the trademark for a family of high-strength crystalline materials made from glass. The first radomes were produced in 1957 under a program sponsored by the Navy and Johns Hopkins University.

AIA Changes Name to Mark Change in Aircraft Industry

Members of the Aircraft Industries Association voted to change the organization's name to Aerospace Industries Association, Gen. Orval R. Cook (USAF-Ret.) AIA president announced.

Gen. Cook told an Aviation Writers Association meeting that the new name reflects the changing nature of the work being performed by the industry.

MIEN

IN THE NEWS



Electric Auto-Lite Co.—Gordon W. Wattles was elected chairman of the executive committee; Robert H. Davies, president; and James P. Falvey, chairman of the board.

General Motors Corp.—**Edward D. Rollert** was elected a vice-president.

Borg-Warner Corp., Ingersoll Kalamazoo Div.—**Byron F. Campbell** was named executive engineer.

U. S. Steel Corp.—**Stephen M. Jenks** was appointed executive vice-president, engineering and research.

Youngstown Sheet and Tube Co.—**Leo DeFiore** has been named director of engineering and **Carl J. Lucas** chief engineer.



White Motor Co.—Joseph E. Adams was elected executive vice-president for manufacturing and development.

International Nickel Co., Inc.—**Thomas A. Stone** was appointed special assistant to the president.

White Motor Co.—**John C. Tooker** was named a vice-president and **Noah O. Gresham**, vice-president of wholesale operations of White Truck Div.



Tung-Sol Electric Inc.—Louis Rieben was elected chairman of the board and Milton R. Schulte succeeds him as president.

R. C. Mahon Co.—**Walter G. Mitchell** was elected vice-president of the Western Div.; **D. L. Buttrey**, vice-president of manufacturing; and **Walter E. Willard**, vice-president in charge of Structural Steel Div.

Raybestos-Manhattan, Inc., Manhattan Rubber Div.—**L. S. Hilton** was made manager of the Abrasive and Diamond Wheel Depts. and **C. Fleming, Jr.**, production and development manager.



Borg-Warner Corp., Long Mfg. Div.—Harry H. Whittingham was appointed president and general manager.

Budd Co.—**Herbert A. Boas, Jr.**, was elected a vice-president.

McLaughlin Co.—**Gardner D. Carpenter** was named chief engineer.

Babcock & Wilcox Co., Boiler Div.—**John G. Martin** is now domestic sales manager.

Vickers Inc., Mobile Hydraulics Div.—**A. L. Caney** has been appointed midwest regional sales manager.

International Business Machines Corp.—**J. A. Haddad** has been named general manager of the newly formed Advanced Systems Development Div. and **Byron L. Havens** technical director.

Waldes Kohinoor, Inc., Truarc Retaining Rings Div.—**Mel S. Nielsen** was appointed Western Division manager.

Westinghouse Electric Corp.—**Fred D. Brown** has been appointed marketing manager of the arc welding department.

General Electric Co.—**Theodore W. Shidler, Jr.**, was named manager of marketing of the Small Aircraft Engine Dept.

Crucible Steel Co. of America—**E. T. Walton** has become director of metallurgy.

Continental-Diamond Fibre Corp.—**W. R. Gotshall** was promoted to district manager of the Indianapolis district sales office.

Durkee-Atwood Co. — **Carter B. Haley** was elected vice-president in charge of Industrial Sales Div.

Thompson Ramo Wooldridge Inc.—**Allen K. Parrish** has been named assistant general sales manager of the Michigan Div.



Dana Corp.—J. E. Peterson was named sales manager, universal joints.

Borg-Warner Corp., Marvel-Schebler Products Div.—**Jack Crossman** was named Western Regional sales manager for Century and Marvel L. P. gas carburetion equipment.

Fram Corp.—**Charles B. Benton** has been named vice-president in charge of national accounts.

Dodge Div., Chrysler Corp.—**John C. Trent** was named manager of industrial engineering at the Dodge Assembly Plant.

(Turn to page 27, please)

Necrology

Edgar L. Apperson, 89, designer-builder of 1893 car (Jack Rabbit) and one of the founders of Haynes-Apperson Auto Co., died May 13, at Phoenix, Ariz.

James A. Lee, 57, director of procurement for American Motor Corp.'s automotive division, died May 9, at Detroit, Mich.

Charles Penhaligen, 57, auditor for Dow Chemical Co., died May 8, at Freeport, Tex.



...Results of a Superior Beginning

The countless parts and products made from Roebling high-carbon steel spring wire and flat spring steel have one thing in common... their superior quality. This, of course, is related to the inherent fineness of the materials.

The variety in which Roebling offers these spring materials is equally impressive. They are available in hard drawn, hard rolled, annealed or soft, tempered or untempered. Types include zigzag and no-sag wires; upholstery and mechanical spring wires; valve spring wire; clock- and motor-type spring steels and flat spring steels of all types and description.

Whatever the type, size or characteristics you require—Roebling can fit your needs exactly. You'll find that Roebling quality means maximum production from your machines and consistent uniformity in your product.

For spring wire and flat spring steel information, contact Wire and Cold Rolled Steel Products Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

ROEBLING



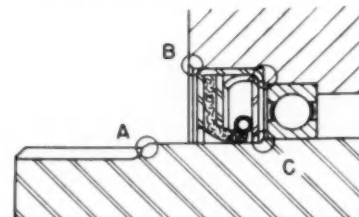
Branch Offices in Principal Cities—Subsidiary of The Colorado Fuel and Iron Corporation

Roebling...Your Product is Better for it

... and engineering tips that can help
you "design-in" better oil seal performance

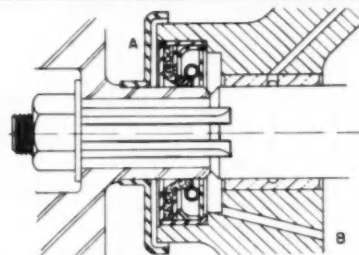
CONVENTIONAL INSTALLATION

Here a standard-design single lip seal retains lubricant and excludes normal dirt, dust and moisture. Sealing lip points in since seal's principal job is retaining oil or grease around bearing. Note that shaft is stepped and chamfered at "A" to prevent damage to sealing lip during installation. At "B", bore is chamfered to facilitate seal entry. At "C", counter-boring insures accurate positioning of the seal.



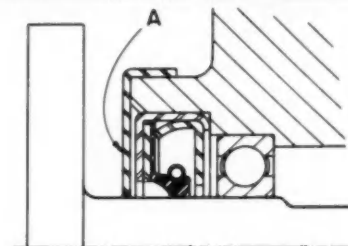
HEAVY DIRT CONDITIONS

Here is a commonly used method of protecting the seal and increasing seal life on applications subjected to extreme dirt conditions. The guard baffle at "A" is welded or swaged to the wheel hub to exclude the major portion of dirt and dust. The drain hole at "B" relieves pressure at the sealing point. In addition to the guard baffle, many manufacturers employ a dual-lip seal to insure bearing protection under extreme dirt conditions.



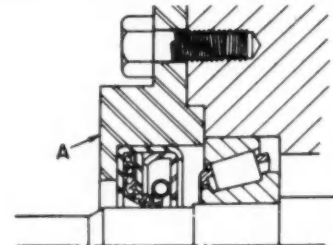
SEALING LONG, HEAVY SHAFT

Many cases of so-called "seal failure" are due solely to poor installation techniques. While today's seals are rugged, they can be rendered non-serviceable if distorted out of round, cocked in the bore, or if the sealing lip is torn. To protect the seal against such physical damage during installation involving a long shaft, a seal protector as shown at "A" may be mounted on the hub O.D.



INSUFFICIENT DEPTH TO MOUNT SEAL

Where the housing does not provide sufficient depth for counterboring, or where seal installation would be difficult or likely to damage the seal, a separate mounting member ("A") can be employed. As before, the shaft should be chamfered to prevent damage to the sealing lip during installation.



NATIONAL SEAL

Division, Federal-Mogul-Bower Bearings, Inc.
General Offices: Redwood City, California
Plants: Redwood City and Downey, California
Van Wert, Ohio



5207

Publisher's Announcement

JAMES R. CUSTER has served as Editor of **AUTOMOTIVE INDUSTRIES** since 1948 with such distinction that his accomplishments have earned the highest esteem of the industry. In the constantly developing editorial program of this magazine, "Jim" has undertaken, at his own request, a new assignment which will expand his opportunity to render an even more specialized engineering service to A. I. readers through his appointment to an important task as "ENGINEERING CONSULTANT."

This is now a top level function on the A.I. editorial staff, providing for a broadening of the engineering activities of Mr. Custer, who is widely known in automotive and aircraft engineering circles.

He is a B.S. graduate of the University of Detroit (1932) and a former research engineer with the Continental Motors Aircraft Engine Division and later a staff engineer with the Chevrolet Division of General Motors.

In his future work, Mr. Custer will bring into A.I. many additional engineering features which will result from his greater concentration on review and presentation of engineering aspects of the industry.

Succeeding Mr. Custer as Editor, Hartley W. Barclay comes to A.I. with a wealth of specialized background in the automotive and metal-working industries. His biographical record in *Who's Who in Engineering* includes a listing of his technical book "Ford Production Methods," published by Harper & Bros as well as details of his published studies of General Motors Corp., part of which appeared as a special supplement to the *Atlantic Monthly*.

Mr. Barclay served two terms as Chairman of the Greater New York Chapter of The American Society of Tool Engineers, and has been consulting research director for The Henry G. Thompson & Son Co. and The Taft-Peirce Manufacturing Co. of Woonsocket, R. I. For more than a decade, he was well known as the Editor of *Mill & Factory Magazine* and served for many years as the Editorial Director of Conover-Mast Corp.

He is currently a Vice-President of the New York Post of the American Ordnance Association.

These changes in the editorial executive organization of A. I. greatly increase its strength and capacity and are a part of the continuous expansion and development of the services of A.I. to its readers.



James R. Custer



Hartley W. Barclay

John C. Hildreth
John C. Hildreth
PUBLISHER

THE MAGNIFICENT MARK IV



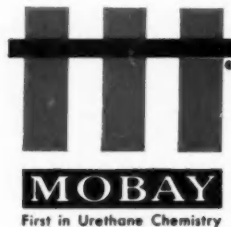
CONTINENTAL

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with cushioning of urethane foam*



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Mobay Chemical Company supplies highest-quality chemicals
used in the manufacture of versatile urethane foams for industry.





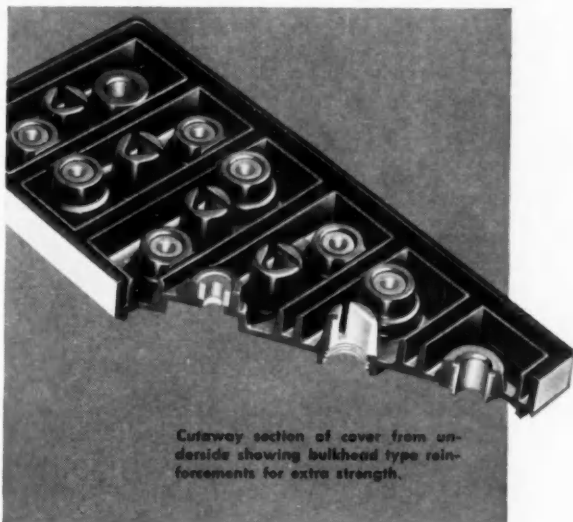
to GLOBE RESEARCH no battery is ever perfect

from **Globe Research**

*first practical
one-piece
battery cover
for*



Cutaway section of top showing one-piece construction, Grip-Ridge and groove for tongue-in-groove joint.



Cutaway section of cover from underside showing bulkhead type reinforcements for extra strength.

- **Extra battery capacity**
- **Greater all-over container strength**
- **Better looking batteries**

Pioneering the one-piece battery cover, Globe research achieved two significant advances:

- 1) A stronger, better performing battery with broader power range and longer life. One-piece cover with tongue and groove construction is weld-sealed to the case to make one inseparable unit. Cell partitions and container are reinforced like a battleship to withstand extreme heat and road-shock abuse.
- 2) More merchandisable battery. Construction permits Grip-Ridge for quickly anchoring Globe battery into battery carrier (any size). Unitized case has modern styling, permits painting in vivid color combinations for trade-up eye-and-buy appeal.

Globe research — as it has for over 30 years — continues to develop battery design advantages like these, which benefit both the original equipment manufacturer and the service industry.

Globe Spinning Power Batteries are now available for fast, low-cost shipment from 16 strategically located plants—15 (*) now producing dry-charged batteries:

*ATLANTA, GA., *DALLAS, TEXAS, *EMPORIA, KANSAS, *HOUSTON, TEXAS, *LOUISVILLE, KY., *MEDFORD, MASS., *MEMPHIS, TENN., *MILWAUKEE, WIS., *MINERAL RIDGE, OHIO, *PHILADELPHIA, PA., *REIDSVILLE, NO. CAROLINA, *SAN JOSE, CALIF., *HASTINGS-ON-HUDSON, NEW YORK, *LOS ANGELES, CALIF., *OREGON CITY, ORE., *TAMPA, FLA.



GLOBE-UNION INC.

MILWAUKEE 1, WISCONSIN

If it's Petroleum-powered there's a GLOBE-BUILT BATTERY right from the start!

BUDD produces Chevrolet Fenders at Rate of 850 per Hour

PRODUCTION of Chevrolet front fenders at the average per-hour rate of 425 left-hand and 425 right-hand has been achieved at The Budd Company's Hunting Park plant in Philadelphia, Pa. In accomplishing this average rate, each of the two press lines functions at better than 500 per hour gross. It compares with 280 pairs

sembly consisting of a fair-size main stamping having formed compound curves, indentations, and flanged sections with perforations—plus several reinforcements.

Three of these reinforcements are small stampings placed in the headlamp opening area. In addition there is a reinforcement about 2½ in. wide that extends from the top to the bottom of the fender at the rear. Also a reinforcement about two inches wide that backs up the mounting flange

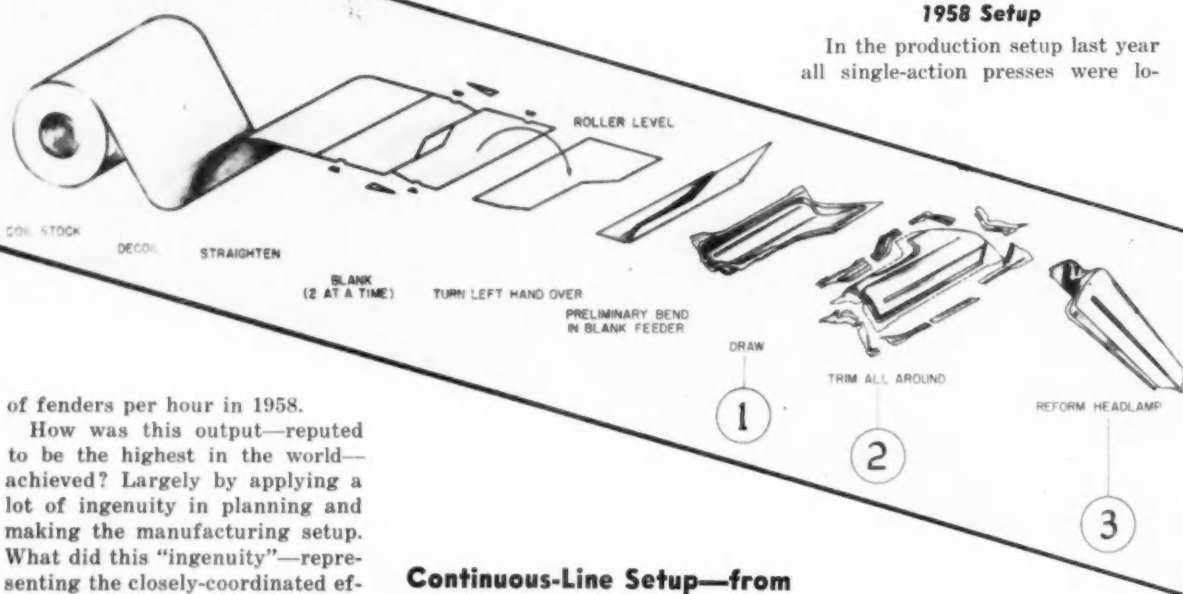
of the fender.

These latter two reinforcements, each a sub-assembly in itself, are welded together to form an L-shaped unit. In the final fender assembly the unit is welded to the top rear of the fender.

The material in the main stamping is cold-rolled drawing quality steel, 19 gage, that is received by the company in 20-ton coils. A thin lubricating oil is used sparingly instead of drawing compounds commonly used in this type of stamping.

1958 Setup

In the production setup last year all single-action presses were lo-



of fenders per hour in 1958.

How was this output—reputed to be the highest in the world—achieved? Largely by applying a lot of ingenuity in planning and making the manufacturing setup. What did this “ingenuity”—representing the closely-coordinated efforts of production planning, die design, methods and equipment, and shop departments—physically produce? Many of the details are described here for the first time.

Fender Make-Up

First a brief look at the work-piece. The 1959 fender is an as-

**Continuous-Line Setup—from
Start of Stamping, Through Assembly, to Shipping—
Makes 1959 Chevrolet Front Fenders
at Extremely High Rate**

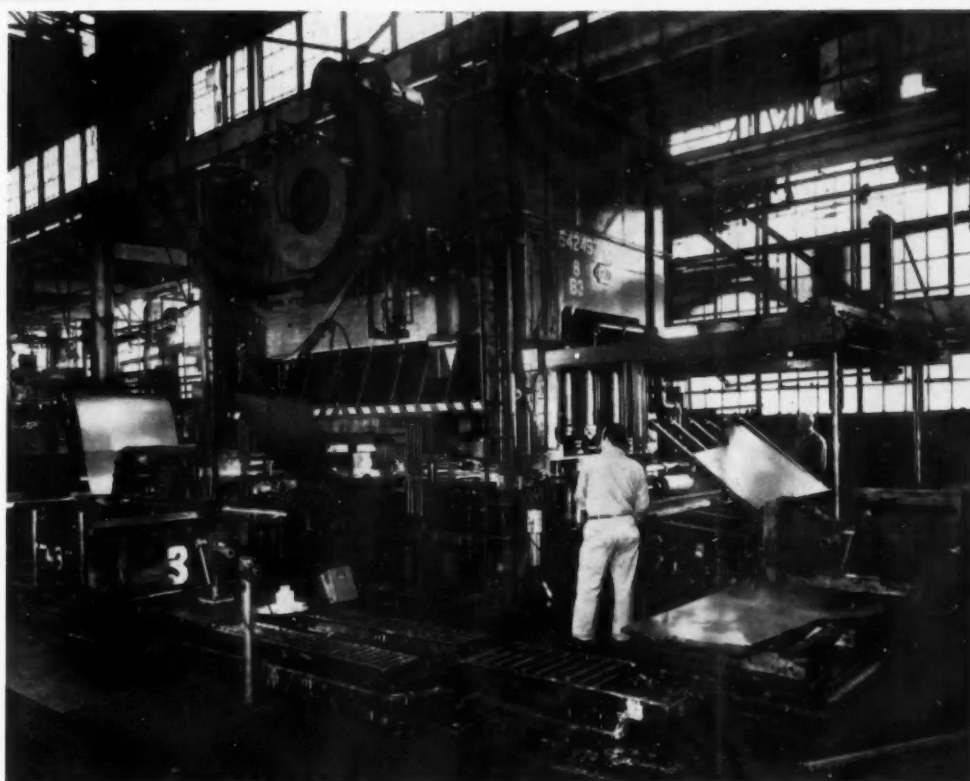
FIG. 1—The progression of major forming operations on the Chevrolet front fender is depicted here, starting with

coil stock and blanking, then through the eight press operations, and finally a clinch operation following assembly.

By
**Charles A.
Weinert**

EASTERN EDITOR

Daniy press makes two fender blanks with each stroke: right- and left-hand pieces are then stacked separately by means of a pull-out device and a magnetic run-out conveyor



cated end to end and the stampings were manually loaded and unloaded from the same side rather than through the presses. This substantially increased the handling time.

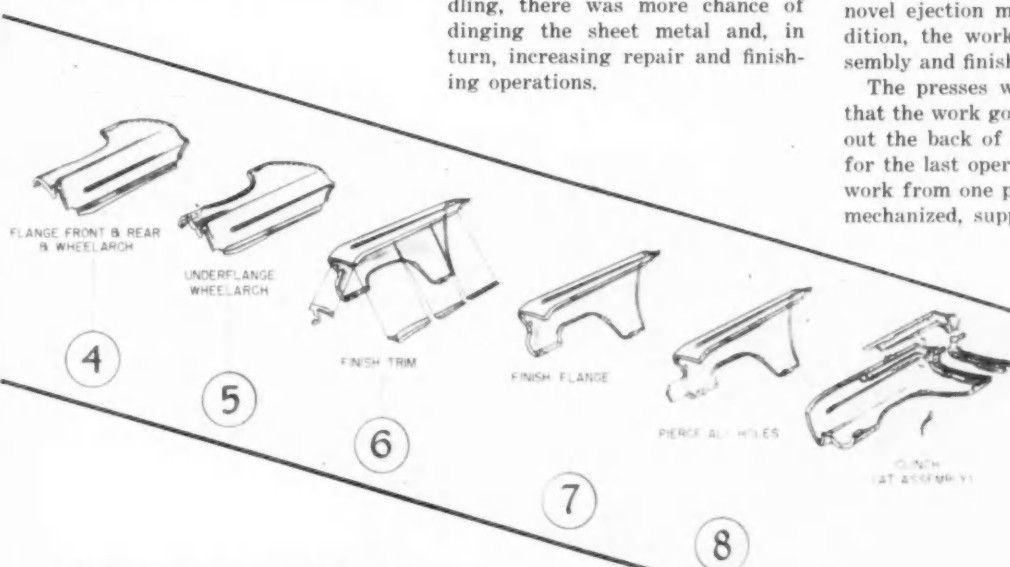
There was also an imbalance between stamping and assembly-finishing operations. The press lines could turn out 280 pairs of fenders

per eight-hour shift, while assembly-finish could handle 319 pairs. Random second shifts on the press lines, and banking of stampings, were therefore necessary in order to feed a constant supply to assembly and finish lines. Besides taking valuable space for storage and requiring additional material handling, there was more chance of dinging the sheet metal and, in turn, increasing repair and finishing operations.

1959 Setup

The latest setup is one continuous line—with no banking—from start of first form, through assembly, to shipping. It was accomplished by rearrangement and rehabilitation of the presses; use of mechanization devices; and design of dies and fixtures incorporating novel ejection mechanisms. In addition, the work flow through assembly and finish was balanced out.

The presses were rearranged so that the work goes in the front and out the back of every press except for the last operation. Transfer of work from one press to the next is mechanized, supplemented by man-



Not shown are the intermediate spot-welding operations and other details covered in Fig. 2 and in the text

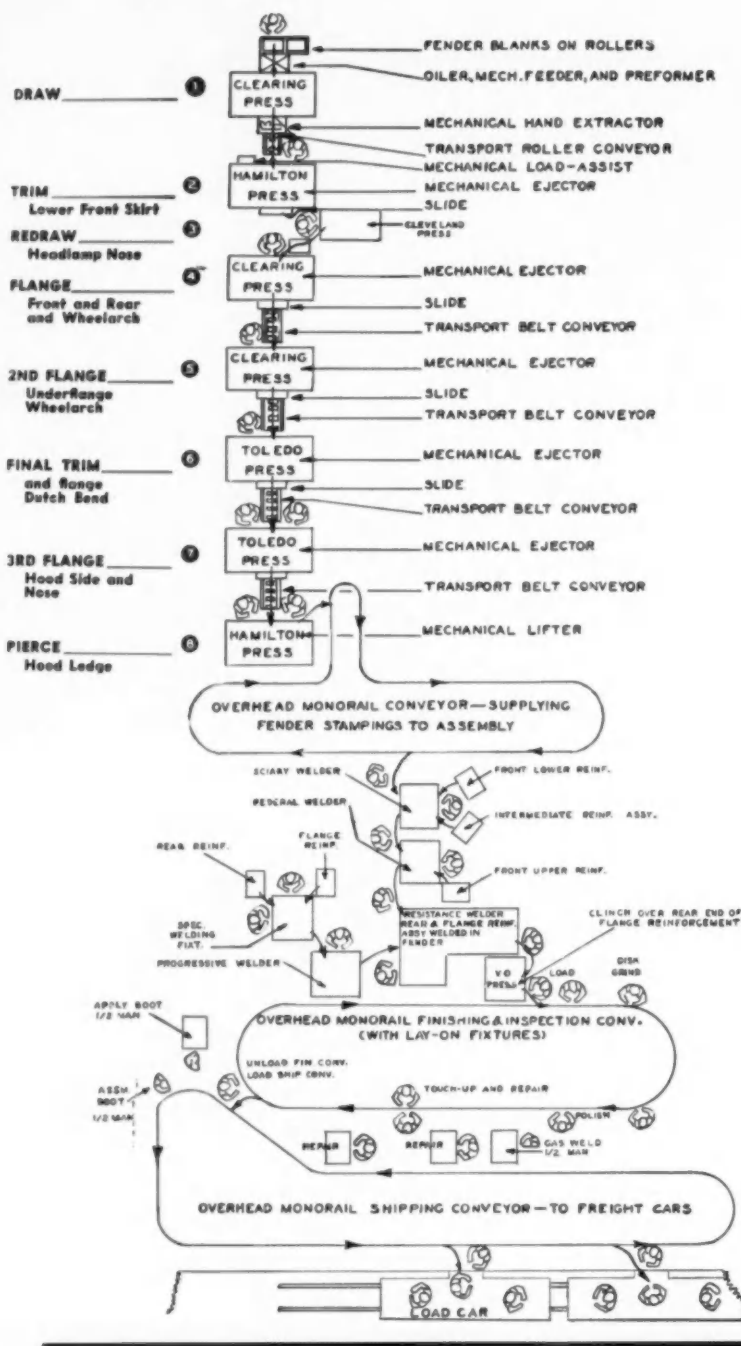


FIG. 2—Overall schematic layout of production line and sequence of operations at The Budd Co. for making 1959 Chevrolet front fenders

ual handling aids. Conveyor speeds are synchronized with press speeds—and work heights of the dies and conveyors are all the same. The dies have built-in locating pins to facilitate loading; and ejectors or

lifters to facilitate removal and transfer of work. There are no obstructions to flow of work into, through, or out of the presses.

Speed of all the presses—except for the two Clearing draw presses

new in 1958—was increased from about 700 to 1000 sph. This was accomplished by a modernization program which consisted essentially of installing new high-speed conversion clutch and brake units, with appropriate gearing and motor changes, in the other Clearing, Hamilton and Toledo presses.

Operations

The major operations performed on the fender are depicted in Fig. 1; while the overall production layout is shown in Fig. 2. Since the principal operations and their sequence will be apparent from these illustrations, they will not be repeated in this text.

However, a number of important details have not been included on these sketches—in the interest of simplicity. It will therefore be the purpose of the following to fill in the essential missing links.

Starting with coil stock—after decoiling, measuring and straightening, a Dandy high-speed blanking press makes two blanks with each stroke. This press is located in another shop, separate from the main fabricating area. The blanks are automatically removed from the press by means of an automatic pull-out device on one side of the press and by a magnetic run-out conveyor at the outgoing end of the press.

The blanks are stacked in right-hand and left-hand pieces. When desired stack heights are reached, the stacks are power-shuttled to the side in both cases, and then strapped—out of the way of new stackings, and without shutting down the press.

Located near the blanking press is an automatic Sciaky dial feed welder that feeds, locates and welds threaded attaching nuts on small, stamped front reinforcements—at the rate of 1200 per hour.

Now going to the main fabricating area—the stamping operations are done on ground level, while the assembly and finishing operations are handled on an upper floor, interconnected by a continuously-moving overhead monorail conveyor.

In the press shop there are actually two lines of stamping presses (the second line is not shown in Fig. 2)—one for right-hand and the other for left-hand fenders. In each of these press lines are eight presses.

Of particular interest, in connection with the press operations, will be some details of the mechanisms incorporated in the dies for ejection of the stampings. Two of these devices are illustrated, and their operation described, in Figs. 3 and 4. They are located, respectively, in presses 6 and 7—as numbered in Figs. 1 and 2 for tying-in purposes. (Continued on next page)

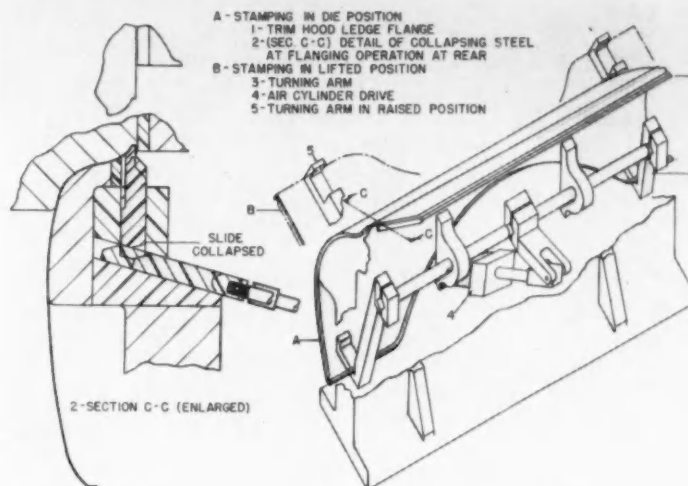


FIG. 3—Die ejector mechanism in press No. 6, where the fender stamping is finish-trimmed

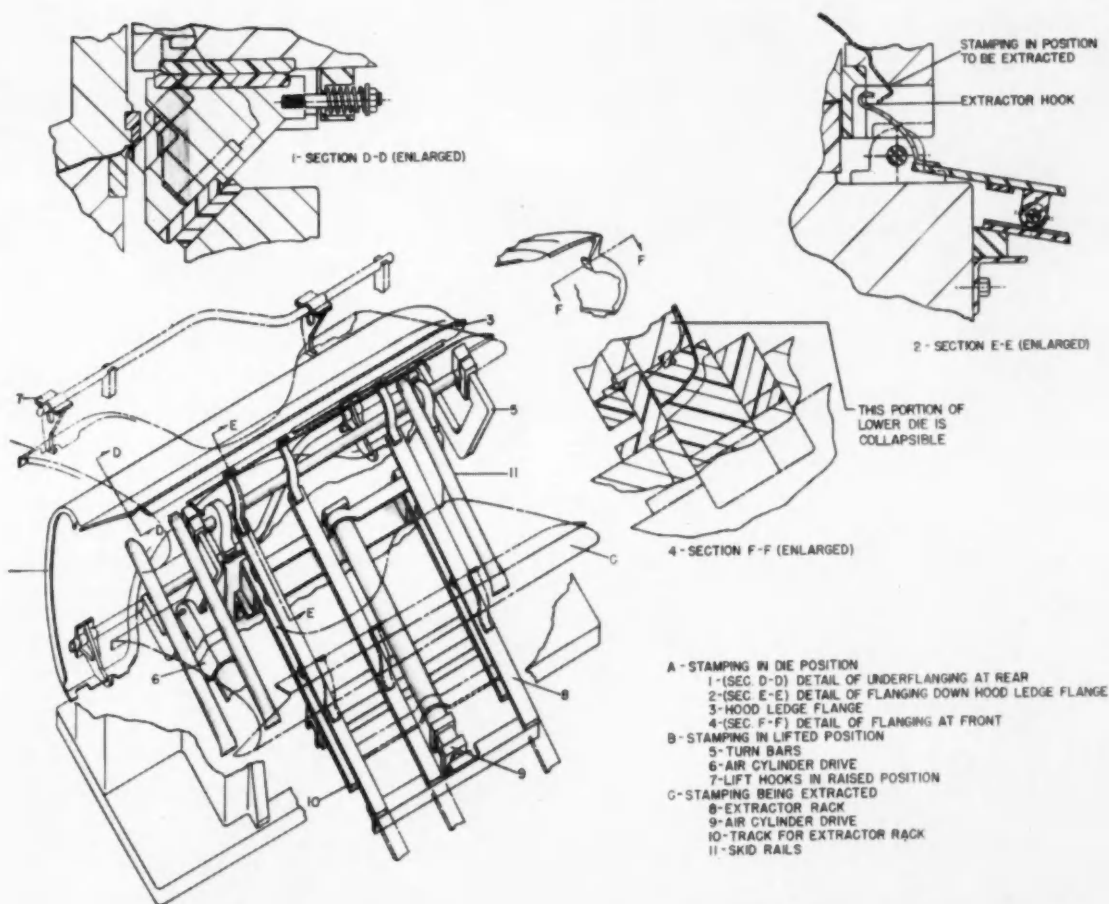
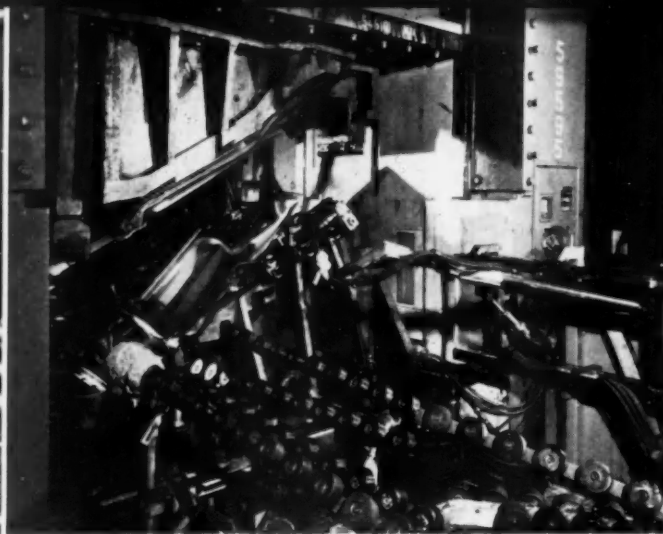


FIG. 4—Die ejector mechanism in press No. 7, where the hood side and nose of the fender stamping are flanged



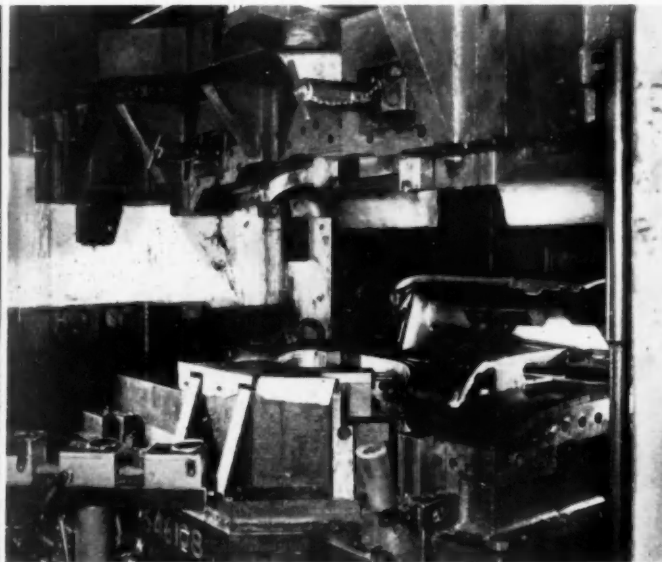
Automatic Sciaky dial feed welder feeds, locates and welds nuts on small fender reinforcements at the rate of 1200 per hour



Exit view of draw press No. 1 showing mechanical hand extractor pulling stamping onto roller conveyor



Leading to press No. 2 is this mechanical load assist which is operated by foot pedal



An automatic lift and kick-out mechanism is built into the die of press No. 4

Mechanical ejectors are incorporated in the die of press No. 6

Conveyor takes fenders from the ground-level stamping lines to the upper-floor assembly area



Actuation of the ejector mechanisms is by air, controlled and timed by rotary switches driven off the crankshafts of the presses. A switch contact energizes the solenoid-operated air valves, thus supplying pressurized air to the cylinders of the ejector mechanisms at the desired intervals in the press cycles. Mechanization and material handling equipment between the presses are also actuated by these same cam switches.

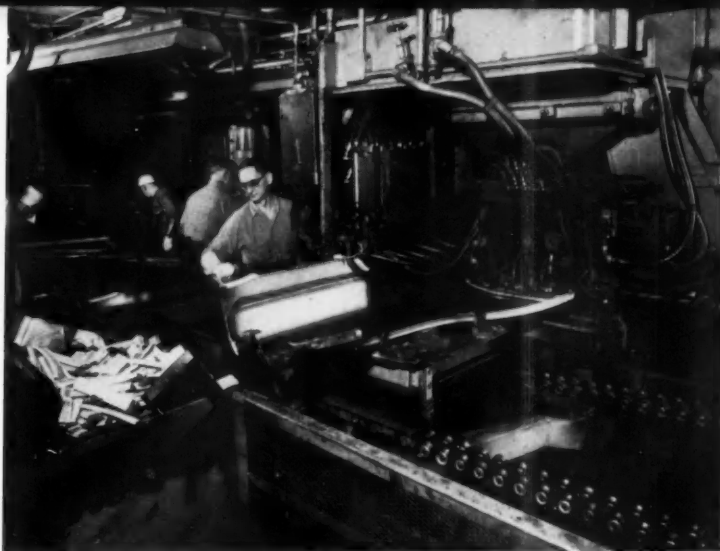
It will be of further interest to note that collapsible dies are utilized in several of the presses to enable release of compound-formed stampings (e.g. see Fig. 3, Section C-C, and Fig. 4, Section F-F). Also, that the number of press operations have been reduced to the minimum by, for instance, combining hole-piercing of flanges with forming operations.

Scrap chutes, built in the two trimming presses of each line, dispose of trimmings by gravity feed to an underground scrap disposal system.

Another detail of interest is that each of the transfer belt conveyors between presses is equipped with a Tektor (Fielden Instrument Div., Robertshaw-Fulton Controls Co.) proximity limit switch. This switch is arranged to sense the normal stopping position of the stamping on the synthetic rubber conveyor belt, so that the workpiece does not run into the press operator. When desired, it can be overridden by a foot switch as an aid to the operator in placing the stamping on the next die.

Rear and mounting-flange reinforcements of the fenders are formed on a separate, and smaller press line (not shown in Fig. 2) which is located in the main press shop. Each of them is also sub-assembled by spot-welding in the ground-level area.

Later on, in the upper assembly section, the two sub-assemblies are spot-welded together in an L-shaped configuration—and then, as a complete assembly, are welded into the fender on a Resistance automatic high-speed welding machine. The three small front-end (headlamp)



Rear and mounting flange reinforcements are spot-welded into the fender on this Resistance automatic welder

reinforcements are also spot-welded into the fender in the assembly section. A noteworthy detail here is that water and nonflammable hydraulic fluids have been adopted for use in welder actuating and clamping devices to minimize fire hazard.

Net Result

In summary, what have been the ultimate accomplishments of this ingenious setup?

It demonstrates how efficiency can be vastly improved by skillful planning and coordination of oper-

ations while still utilizing existing facilities.

It has eliminated storage of work in process, and reduced material handling.

It has made possible increased productivity—850 fenders per hour average, versus the 560 per hour produced by a prior line—and lower manufacturing costs.

The skills and know-how employed by this independent supplier in its efforts to retain a competitive position have made valuable contributions to the automobile industry. ■

Dodge Notes Production Boost In Its 1959 Four-Door Models

Dodge Div. reports four-door models accounted for 70.4 per cent of all 1959 model production through March.

The four-door sedan, which tabbed 38.9 per cent of production during 1957 and 39.7 last year, accounted for 43.8 per cent of output so far this model year.

The four-door station wagon accounted for 14.5 per cent of all production, and the four-door hardtop boosted its share from 11.2 per cent a year ago to 12.1 per cent in the current model run.

Dodge also reports a 23 per cent increase in demand for six-cylinder engines over 1958.

Another trend: Pontiac convertibles are accounting for a record 8.6 per cent of current deliveries, compared with 6.3 per cent a year ago. Over a six-month period, 6.5 per cent of

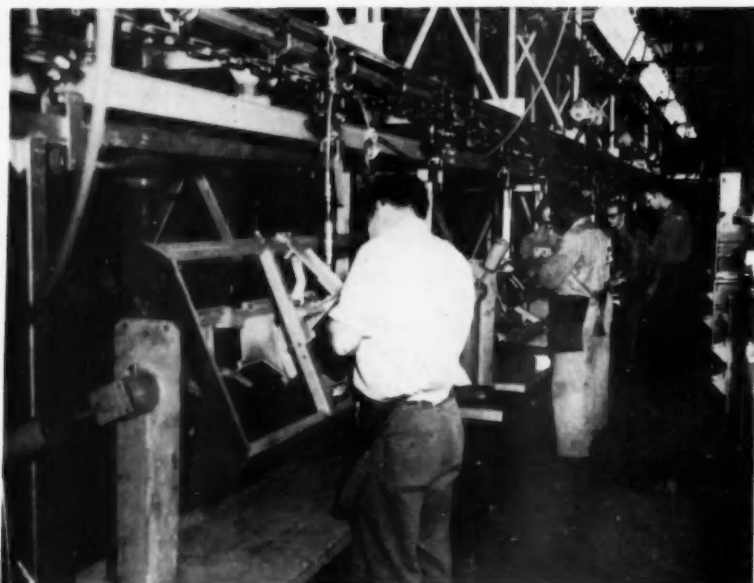
Pontiac sales have been convertibles, while only 4.7 per cent were convertibles a year ago, during the same period.

Record Sales Posted by M-F For First Six Months of 1959

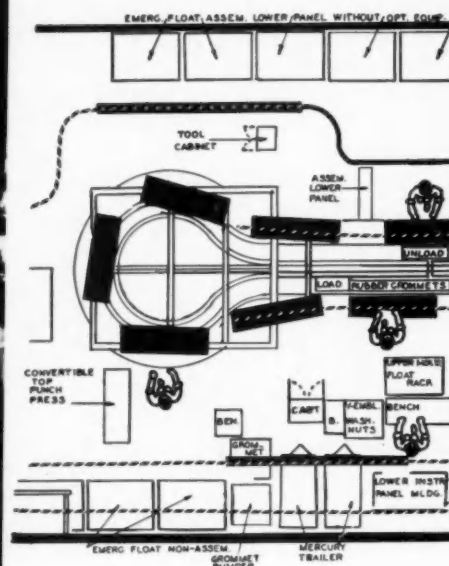
Record sales were posted for the first six months of 1959 by Massey-Ferguson Ltd. Canadian farm implement manufacturer.

On a world-wide basis, total sales of \$235 million were 12 per cent over the same period of 1958 and the best six-month period in company history. On a regional basis, North American sales of \$104 million showed an even better gain—\$31 million, or 43 per cent, over last year.

Canadian sales were up 62 per cent, U. S. sales were up 41 per cent, and "substantial" gains were recorded in Australia and the U. K.



Perspective of section of front instrument panel assembly line showing the fixtures in different positions to suit the operation. Note how the operator can stand close to the fixture; also the accessibility of air tools and proximity of lighting.



Special Overhead Conveyors

AFTER many years of working with floor type flat face conveyors for the assembly of such parts as grilles, front and rear bumpers, etc., the Cadillac Motor Car Division discarded all previous practice and adopted a special type of overhead conveyor configuration for suspended assembly.

With the start of 1959 production Cadillac put into operation three different closed loop overhead conveyor assembly lines—one for the lower instrument panel group; one for the upper instrument panel group; and a third conveyor for the assembly of front and rear bumpers.

Plan view layouts of the assembly lines for the upper and lower instrument panels are reproduced here to show the general form of each one; also to indicate the flexibility of the basic concept in varying the configuration to suit the needs of a specific assembly. It may be of interest at this point to examine some statistics given here on each of the three lines to be discussed here.

	Developed Chain Lgth (Ft)	No. Fixtures	Overall Lgth (Ft)
Lower Instrument Panel Conveyor	250	25	132
Upper Instrument Panel Conveyor	180	18	88
Bumper Assembly Conveyor	400	40	198

Cadillac management assigns innumerable important advantages for this type of assembly conveyor. Some unique design features embodied in their construction are responsible for many of these advantages. It may be seen in the illustrations that the design of the fixture itself represents many advanced concepts. For one thing,

By
Joseph Geschelin

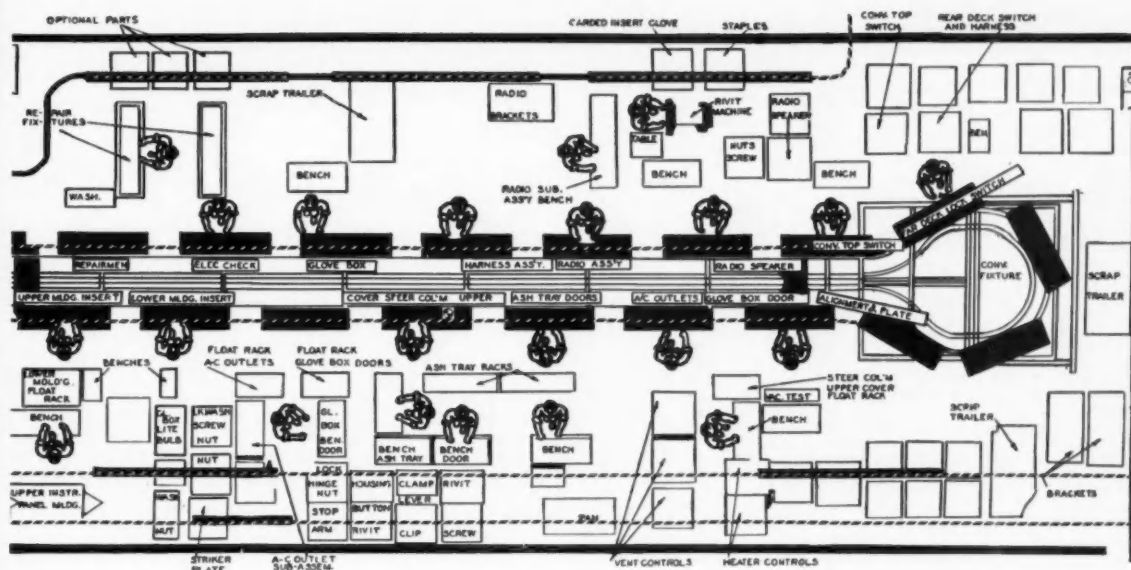
DETROIT EDITOR

the fixture is offset forward so as to be within easy reach of the operator. Because of this the fixture not only is suspended from the monorail on hangers in the usual fashion but it is also balanced by rear arms terminating in rollers

which contact an auxiliary rubber rail. This balances the fixture and also provides a firm support against any to and fro movement of the fixture.

The suspended line makes it possible to provide the most convenient working height for the fixture and work; makes it an easy matter to provide light of proper intensity directly over each work station; makes it possible to suspend the air tools directly over the line of work without interference. There are many other advantages: for one thing, workers or inspectors can move freely between the fixtures without hazard, whereas in the case of a floor conveyor it is necessary to walk completely around the line or provide a stile over the line.

One of the noteworthy features of the type of fixture employed at Cadillac is the provision of one or more tiers of trays to store small parts and fastenings. They are within easy reach of the operator; eliminate storage bins and the necessity for leaving the station to get parts. This storage capacity



for Small Parts Assembly at Cadillac

coupled with the fact that the entire area under and around the fixtures is clear makes for a major saving in inventory. Even if small

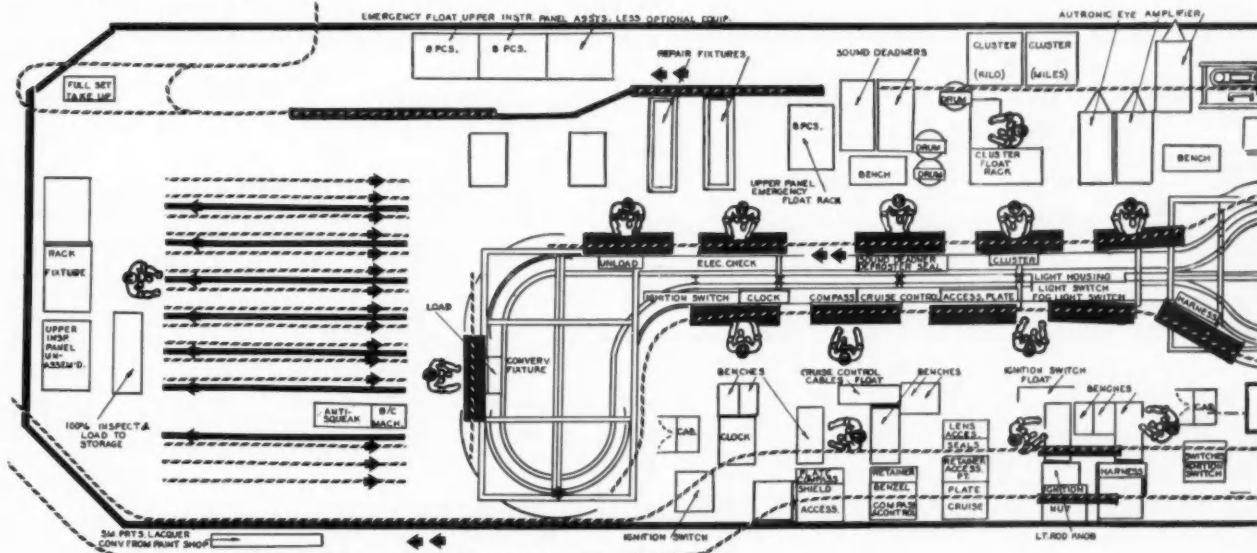
parts or fastenings are misplaced or drop onto the floor they can be swept up and salvaged.

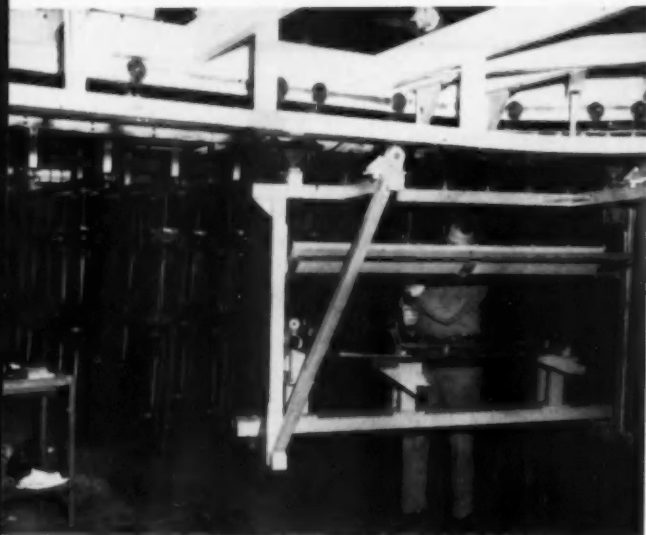
Looking at the schematic illustration of the upper instrument panel line, it will be noted that panels of different colors are stored on 15 racks at the start of the line

at the left. The operator at the loading station selects a panel of the proper color according to schedule. The various components then are added by the individual operators along the line, as noted on the layout. Sub-assemblies for installation on the panel are built

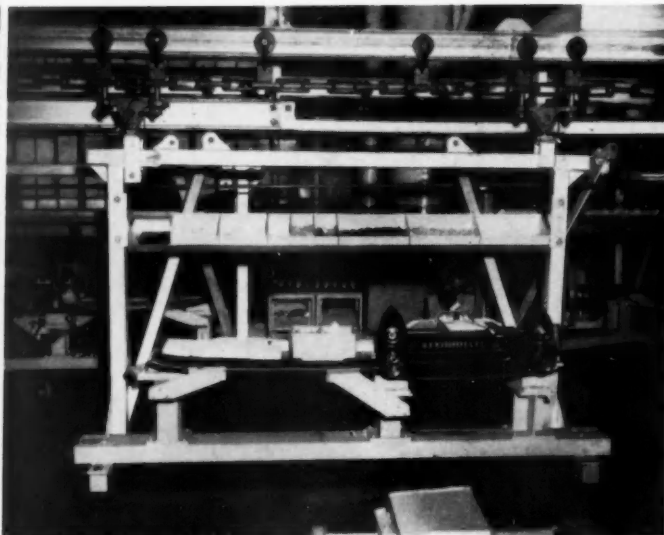
SCHEMATIC LAYOUT

Suspended assembly
for Upper Instrument Panels





Upper panels are stored, according to color, on the racks in the rear. Here an operator is installing an upper panel on the first rack. This view shows the stabilizer arms at the rear of the fixture.



Close-up of one of the upper instrument panel fixtures with panel in place. Note the tray above the fixture, containing the fastenings required for the operation.

UPPER INSTRUMENT-PANEL FIXTURES

up along the side of the line at points of usage so as to be within easy reach of the assembler. Fixtures are widely spaced to provide ample room.

The fixtures on the lower instrument panel assembly line are provided with a special trunnion mounting for the panel since this panel requires the installation of a considerable number of details and parts, and must be turned in a number of positions to facilitate assembly. As in the case of the upper panel, this line has a variety

of subassembly stations on each side for the preparation of parts for assembly. The sequence of operations together with an identification of individual stations will be found on the layout.

The third assembly conveyor is of similar design and is used for the assembly of front and rear bumpers. Formerly each of these was assembled on an individual floor conveyor. In the present arrangement the alternate fixtures take front and rear bumpers. One of the interesting features, illus-

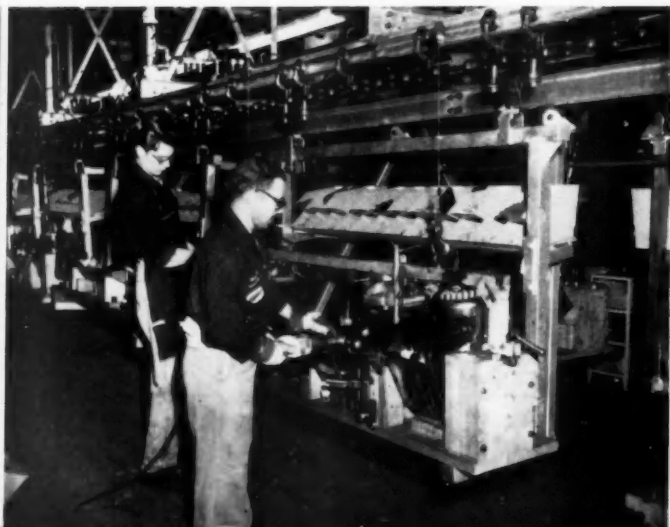
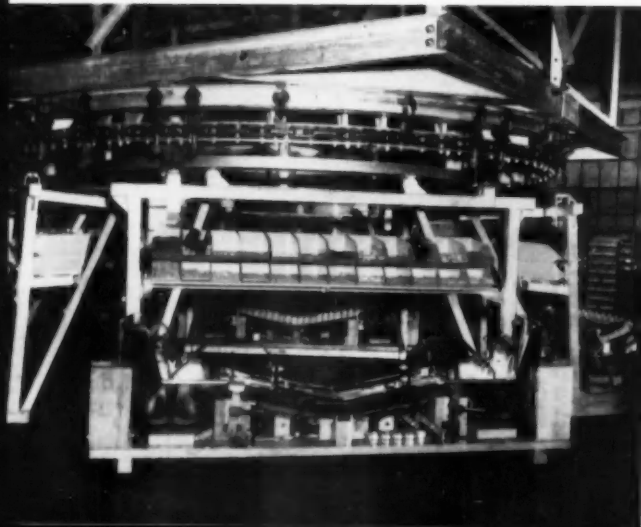
trated here, is the simple fixture used for aligning bumper attachments and holding them securely while the fastenings are made up.

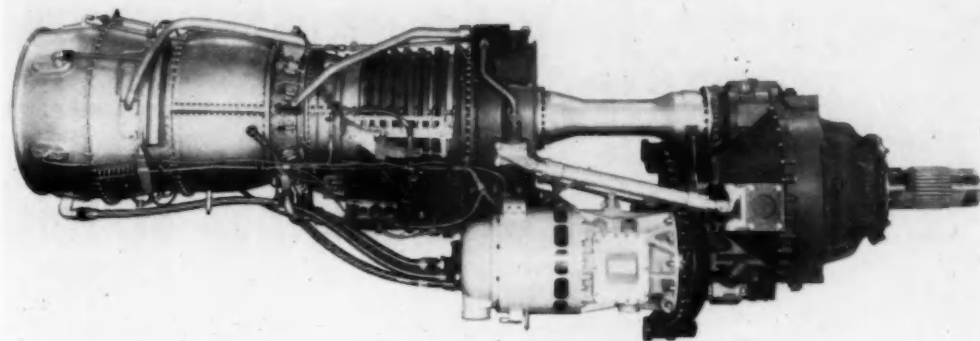
From the standpoint of management one of the major advantages of this new conveyor system is that the fixtures can be changed readily and without loss of time in the event of product changes. Fixture spacing is wide and the fixtures are considered large enough to accommodate product changes that may take place considerably into the future. ■

BUMPER ASSEMBLY-LINE FIXTURES

Here is a close-up of the bumper assembly conveyor, showing one of the front bumper fixtures. On this line the fixture is provided with a double tier of trays for holding the various small parts and fastenings.

A view along the bumper assembly line. Here is shown the fixture for holding bumper attachment bars in proper alignment while the operators make up the heavy fastenings.





General Electric T64-GE-4 turboprop gas turbine weighs 1079 lb and delivers 2570 equivalent shp with an esfc of 0.522

General Electric T64 Gas Turbine

Features Low Specific Fuel Consumption

GENERAL Electric Company's latest aircraft gas turbine engine, the T64, has been designed in two powerplant versions—a turboshaft model for large military helicopters, and a turboprop model for tactical and support propeller-driven aircraft, including VTOL transports. It will also be made available as a direct-drive model for use in aircraft which have existing power transmission systems.

The turboshaft model T64-GE-2 is formed by adding a helicopter reduction gear to the basic power section. This version weighs 854 lb, and delivers 2650 military shp with a specific fuel consumption of 0.506. It has an overall length of 91 in., a width of 24.75 in., and a height of 30.4 in.

The turboprop model T64-GE-4 is made up of the main power section plus propeller reduction gear and propeller brake. This unit weighs 1079 lb and delivers 2570 equivalent shp with an esfc of 0.522. Its net thrust at military rating is 565 lb. Overall length is 113 in., width 29 in., and height 36 in.

Design features of the engine include: axial flow compressor; two-stage gas generator turbine; and two-stage "free" power turbine.

The compressor has a smooth single-spool steel rotor with 14 stages of blades. Blades can be removed individually without rotor disassembly. The first two stages are shrouded. Inlet guide vanes and first six stages are variable. Compressor casing is a steel unit, split and flanged along the horizontal centerline, and contains removable stator vanes.

The combustor is straight-through and annular, and is split for accessibility and replacement. A single fuel manifold feeds 12 fuel nozzles of the duplex type with integral flow dividers. The nozzles are mounted externally on the compressor rear frame outer diffuser wall. The two ignitors, likewise mounted externally, are fired by a 28-v d-c capacitor discharge ignition system.

The gas generator turbine is a two-stage, axial flow type, directly coupled to the compressor rotor by spline connection. Its casing is also split and flanged for ease of servicing. A low-pressure air impingement starter manifold is located on the casing. Provision is also made for mechanical starting.

The two-stage, axial flow "free" power turbine is mechanically independent of the gas generator turbine. Output torque measurements are provided by a torque

sensor on the power turbine shaft. A pick-up on the power turbine provides over-speed protection.

Both engine configurations make use of the same control components. The control systems include a hydro-mechanical, proportional-speed fuel control and compressor variable geometry control, as well as an electrical over-speed, over-temperature control. The turboshaft model also has a free turbine speed control.

The engine has been designed to operate continuously at attitudes 100 deg above to 45 deg below horizontal, which makes it adaptable for application in VTOL/STOL tilt-wing aircraft and 45-deg "nose down" helicopter operations.

The T64 is being developed by GE's Small Aircraft Engine Department under a contract awarded by the U. S. Navy's Bureau of Aeronautics. The planned development program calls for 10,000 hours of testing to have been accumulated when the engine goes into service. For this purpose, GE is constructing four test cells—two for turboprop engines, and two dynamometer cells for turboshaft engines. One of each type is now in operation, with the others slated for completion and availability this year. Experimental flight testing is expected to begin in 1960. ■

MECHANIZED HANDLING

Expedites Production of Bumper



Fig. 1—Prepolished blank for Chevrolet commercial car bumper bars and the stampings as they appear after successive press operations.

At the Chevrolet Division Spring and Bumper plant in Livonia, Mich., bumper components are produced in large volume. As all major bumper components are steel stampings, equipment for making

them is extensive and designed for output at a high rate.

An important factor that promotes economy along press lines is mechanization, some involved in loading blanks and stampings in

process and some in unloading the stampings and advancing them to succeeding operations. This applies not only to lines for passenger car bumper stampings but to one line used solely for stamping the major bar of bumpers for Chevrolet commercial vehicles. This bar, from blank to finished shape, is shown in successive stages of production in Fig. 1. Details of operations are given in this article.

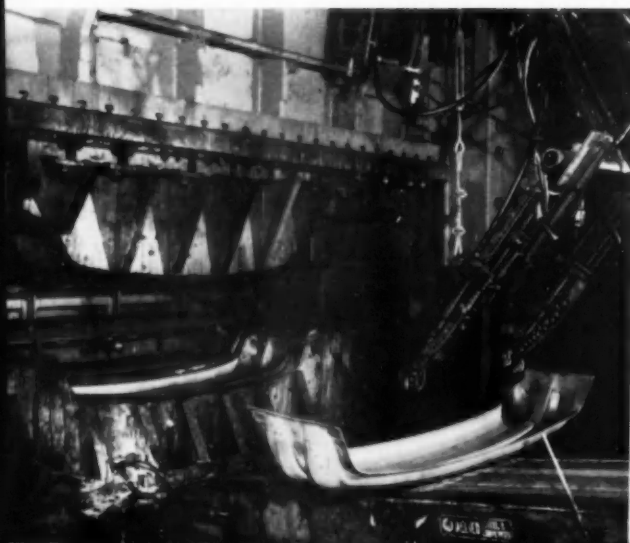
For commercial bumper parts, the blanks employed are 0.150 in. thick. They are purchased to size and first are passed through a line in which one face is polished by a long row of machines. At the end of this line the blanks are phosphated, lubricated and dried, partly to minimize scratching in subsequent processing and partly to avoid the need for lubricating in press dies. Prepolishing and reduction of scratching greatly reduce wheel and

(Left)

Fig. 3—Jaws of this Sahlin Iron Hand have just released a double bar stamping, pulled out of the die, onto the belt for advance toward the next press.

(Right)

Fig. 4—Bar stampings on a carriage by which they are moved into a die that performs piercing and initial trim and parting operations.



By Herbert Chase

Bars for Trucks

belt polishing after stamping and before plating.

Blanks coming from the pre-polishing line are stacked and then are transferred in stacks to the feeder, Fig. 2, for the first draw press, which is of 2500-ton capacity. This press and all others in the line are of Verson type. Blanks are large enough to produce two bar impressions in the first draw but the duplicate stampings are not cut apart in the first press, which is fed automatically.

Each blank is picked up by suction cups on the carriage of the loader and is elevated to a point where jets of compressed air are directed against each end. If two blanks stick together, the jets cause the lower blank to be separated and drop back onto the stack and avoid the chance of double loading. After this, the blank retained is advanced by the carriage and, before the car-

riage retracts, is released onto rolls that move it into the draw die. There, the blank is positioned correctly by stops and side guides.

Motions of the loader are timed, of course, in synchronism with the press which makes six working strokes a minute. As the die opens, the double grippers of a Sahlin Iron Hand, mounted on the back face of the press, are swung in automatically, grip the double stamp-

ing, pull it out of the die and release the workpiece onto a short conveyor, as in Fig. 3.

This belt advances the stamping onto another similar belt conveyor from which it is picked up by the carriage, Fig. 4, that loads the stamping into a parting, trim and pierce die. In this die, the stamping is severed into two parts at the same time that trimming is done.

(Turn to page 70, please)

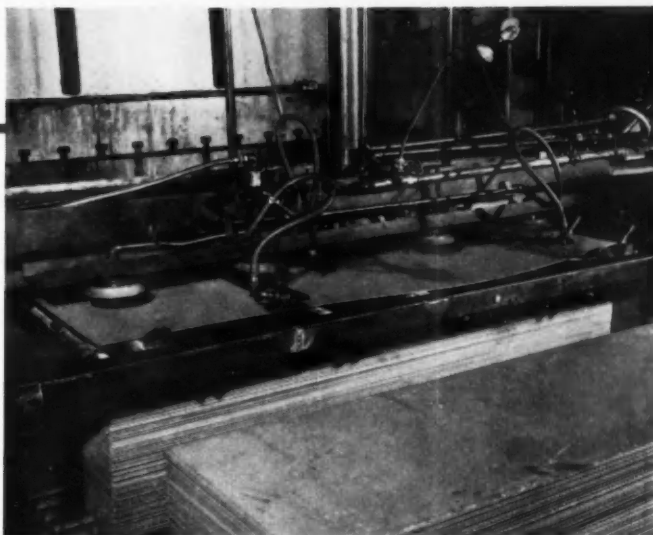


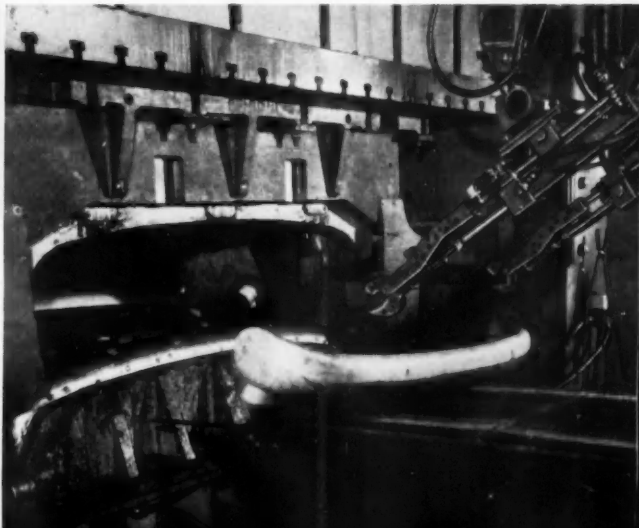
Fig. 2—Suction cups on the carriage here shown have just picked up a blank from a stack and have released it onto the loader that will advance the blank into the 2500-ton draw press after its die is opened and the prior piece is removed.

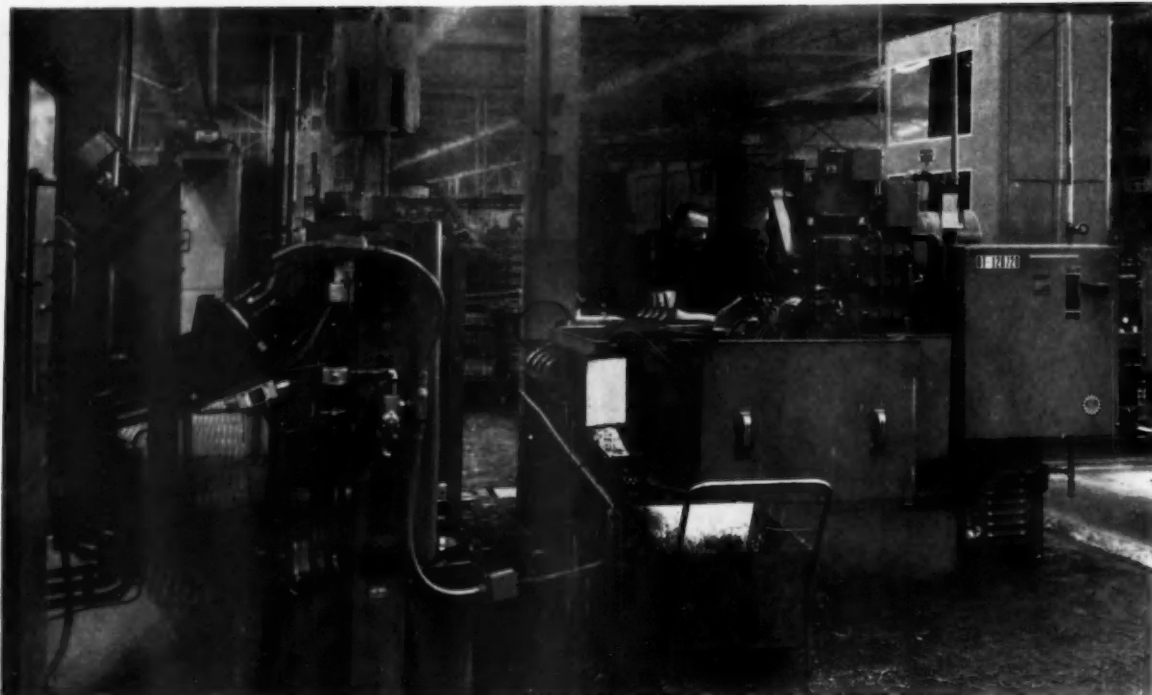
(Left)

Fig. 5—Stampings from the die, Fig. 4, undergo trimming and are cut into two parts in the die here shown. They slide out one at a time onto the belt at right.

(Right)

Fig. 6—Flanging is done, one piece at a time, in this die, after which the two jaws of a swinging Sahlin Iron Hand lift the stamping out and release it onto a belt for advance to the final trim operation.





As the blanks are machined and gaged they are transported to the Gear-O-Mation storage unit seen at the extreme right; then fed on demand to the four-spindle New Britain precision-boring machine. It faces the blank, forms the thrust face diameter, chamfers all over.

Ford's Automatic Lines for Transmission Planet Gears

PLANET gears for automatic transmissions must be produced meticulously and with unusually close control in order to provide fine running gear sets free from back-lash and noise, and capable of handling high loading without failure. Such requirements are difficult enough in low production; they present special problems where high volume is involved. At the Sharonville automatic transmission plant of Ford Motor Co. planet gears not only are produced at high output but they are proc-

essed on completely automatic lines.

This article is concerned primarily with the automatic line for making the short planet gear. All of the equipment on this process line is fully automatic with automatic loading and unloading; automatic gaging; and automatic transport of parts from one operation to another. Automatic transport is handled by an advanced type of material handling system featuring, in the main, the latest types of Gear-O-Mation equipment developed by Michigan Tool. It en-

compasses gravity feed conveyors, elevators, storage units, diverters, and distribution conveyors for feeding a number of similar machines for a given operation. Gear-O-Mation storage units vary in capacity, depending upon the application, from 2000 to 1500 pieces on this line.

The accompanying production drawing gives the principal dimensions for the finished short planet gear, indicating the nature of tolerances on the blank. In addition to dimensional tolerances certain elements must be held in close control with respect to other elements. For example, diameters A and B must be concentric within 0.002 in. total indicator reading; diameters A and C must be concentric with 0.005 in. total indicator reading; while surfaces Y and Z must be parallel and square with diameter A within 0.001 in. total indicator reading. The honed bore is held to 0.8020-0.8015 in. after heat treatment, honing being required to remove at least 0.0003 in. of stock on the diameter. Moreover, this bore must

By Joseph Geschelin

DETROIT EDITOR

PART III

be smooth, round, and uniform in diameter within given limits for the full length. Taper must not exceed 0.0002 in. per inch of length; and roundness has to be within 0.0003 in.

With such requirements it is easy to visualize the degree of control that has to be exercised for every step of a strictly automatic cycle of events.

The sequence of events begins with the preparation of blanks in National Acme 8-spindle, 2½-in. automatic bar machines, using cold drawn SAE 5130 bar stock of fine grain quality and annealed. Turning the gear blank, drilling, reaming, chamfering, facing, forming, shaving, breakdown, and cut-off all are subdivided among the eight stations of the automatics. Blanks then are transported automatically by gravity track, a power conveyor, and elevator to feed a continuous type washer.

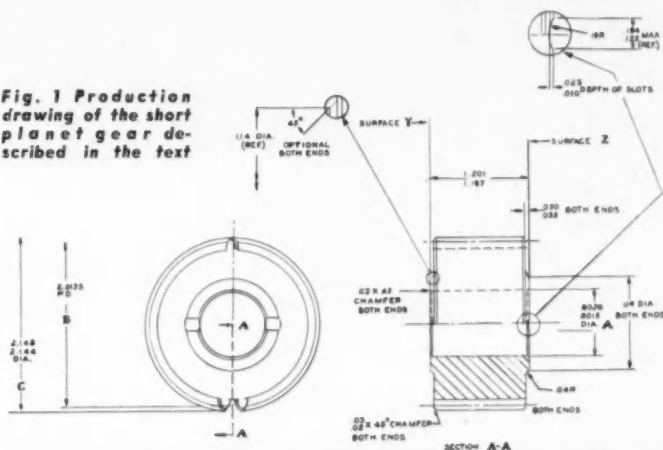
Another gravity track conveys blanks from the washer to the Sheffield automatic inspection and orientation gaging machine. This checks ID and OD size and concentricity, and squareness of the chamfered face with the bore. As parts flow out of the gage they move on a track to the first Gear-O-Mation storage unit, holding 2000 pieces, feeding on demand to a four-spindle New Britain precision boring machine. This faces the blank, forms the thrust face diameter, chamfers both the OD and ID. Facing is held square with the bore within 0.0005 in. total indicator reading.

Next step is the hobbing of gear teeth, this being done automatically in a battery of 27, Lees-Bradner Model 7 HD, single-spindle hobbing machines. An extensive material handling system is required in this area to convey, elevate, divert



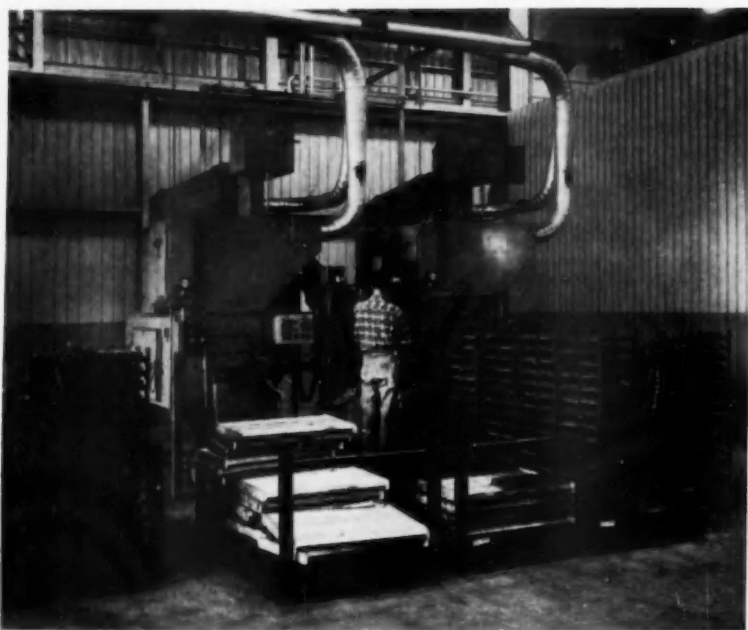
Hobbing of the 31-tooth gear is done in a fully automatic cycle of loading and unloading in a battery of some 27 Lees-Bradner single-spindle gear hobbers. A portion of this battery is seen in this view. They produce 4200 pieces per shift.

Fig. 1 Production drawing of the short planet gear described in the text



Sharonville uses gear shavers supplied by both Michigan Tool and National Broach. Seen here is a National Broach group of gear shavers on another line. This view is shown primarily to indicate the nature of automation linking machines in the gear making departments. Gears enter on the overhead-mounted Gear-O-Mation distribution conveyor, fitted with diverters to supply each machine on demand. Shaved gears come out of the machine on the chutes in the foreground.





Manual handling for heat treat marks the only break in automation. In this view the heat treated gears, in baskets, are transported to the Pangborn grit-blasting machines to provide gears with teeth smooth and free from foreign matter.

to two 1500-piece capacity Gear-O-Mation storage units; thence to a distribution system that feeds each of the hobbing machines on demand.

Gear data for this operation are as follows:

No. teeth	31
Normal DP	16
Helix angle	15-deg, 47-min, 43-sec, LH
Lead	22.3615 in.
Normal pressure angle	26 deg

Backlash is held to 0.005-0.008 in., maximum tooth to tooth spacing error 0.0005 in., and maximum cumulative tooth spacing error held to 0.0010 in.

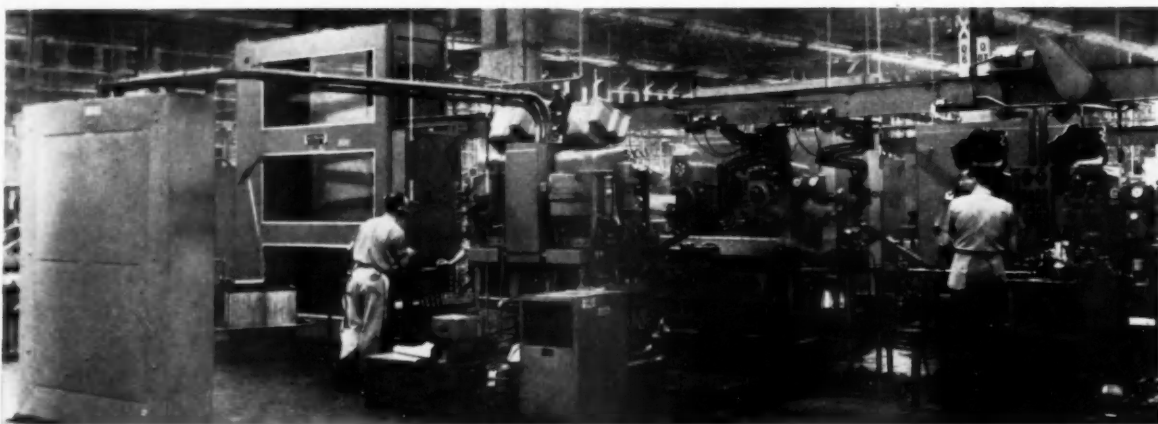
Blanks are fed automatically, one by one, to the hobbing station, unloaded automatically, proceed along a gravity track, a powered collection conveyor, and an elevator to

feed an inline washer. Incidentally, the last five pieces of each run on the hobbers is held at the hobber for identification until the gear laboratory has completed sampling inspection. If there is anything off tolerance, the offending machine setup can be traced through the pieces left at the end of the run.

From the washer blanks proceed along a gravity chute and are diverted into an automatic gear checker to verify size and lead angle, the size being governed by the amount of shaving stock to be removed. Accepted gears are automatically transported to a storage unit for delivery, on demand, to a battery of five Michigan Tool Model 807A-8-in. rotary gear finishing machines for crown shaving. Shaving is held to extremely close tolerance, maximum permissible crown being 0.0002 in.

Once again the gears are transported to an elevator, then through an inline washer, and out on a gravity track to a diverter which feeds them through an automatic gaging machine. Here they are checked for eccentricity, size and lead angle, accepted gears being moved directly to a National Red Ring Model CSC-10-in. sound testing machine. This is a sampling inspection rather than 100 per cent.

Gears are transported from this point to a station for counting and



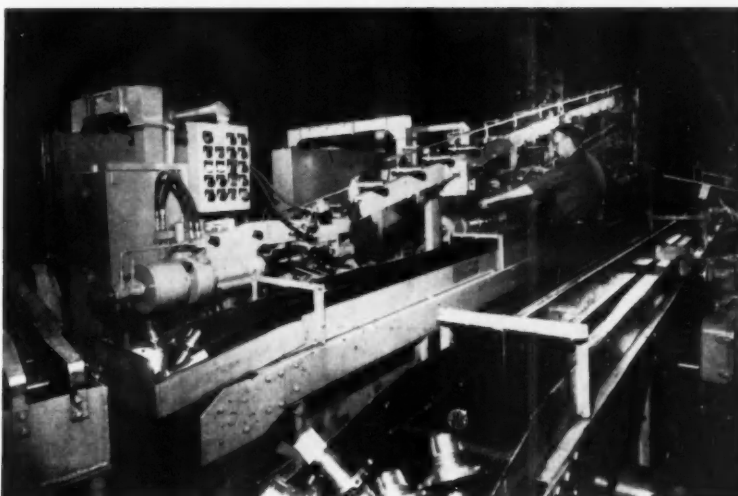
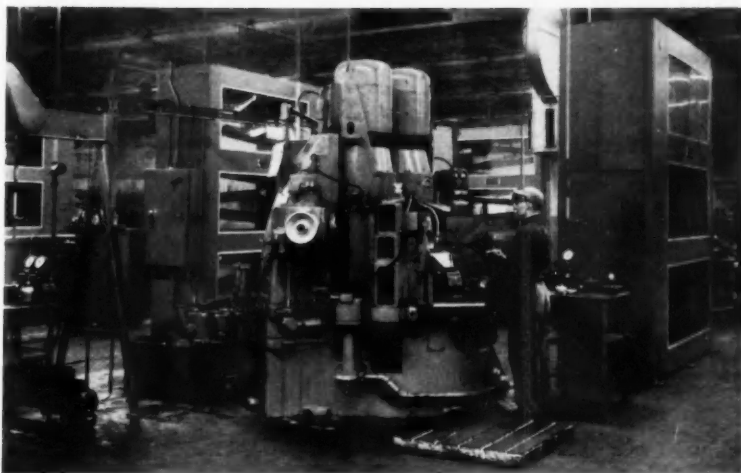
Gears have the bore finish-honed smooth and in this battery of three Micromatic honing machines. They are of two-spindle design—one spindle for semi-finish honing, the other for finish-honing. Note the details of full automation. First is the Gear-O-Mation storage unit at the extreme left; then the distribution conveyor mounted overhead in the background; and finally curved path chutes feeding each of the honing machines on demand.

Both sides of the gear are ground flat, to size, and to the required surface finish in two Blanchard surface grinders. This is a "first" at Ford—with full automation for feeding from the storage unit and automatically unloading for transport to the next operation. (Note: when this photo was taken the loading automation had not yet been installed.)

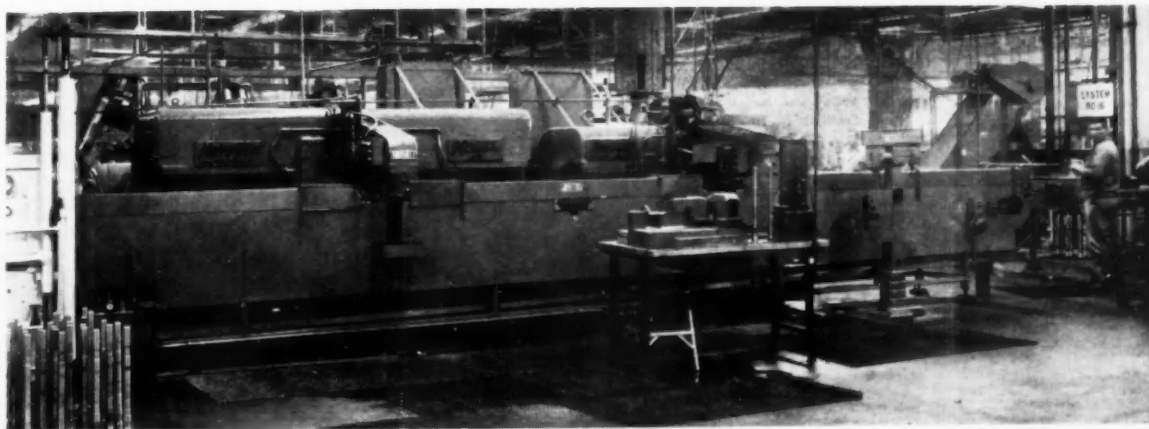
manually loading into baskets for heat treat. This too marks the only break in the fully automated line. The work is given a case hardening treatment in a Holcroft pusher type furnace to develop a case depth of 0.008-0.016 in. on the bore; allowing for an extra 0.003-0.009 in. on the two faces for grinding.

The parts then are grit-blasted in a special Pangborn machine to have the teeth smooth and free from foreign matter. After unloading from the baskets, gears once again start on an automatic cycle. First operation in the hard is grinding the profile chamfer on both ends of each gear tooth in a Jos. Lamb automatic chamfer grinder. Then they move on a gravity track to feed a Jos. Lamb groove grinding machine.

Gears leave this operation on a gravity chute to load into a storage unit, thence to a distribution conveyor for feeding each of three



Another "first" at Ford. Splines on the long stem of the stator support are produced by hobbing automation on the Barber-Colman equipment shown here.



Latest example of spline rolling equipment is illustrated here. The end spline section as well as a helical gear near the center of this long shaft are both produced in the Michigan Tool Roto-Flo machine shown. The workpiece is moved through the two stages by means of Gear-O-Mation equipment.

Micromatic honing machines. These are two-station machines, with automatic indexing, for semi-finish-honing at the first station, finish-honing at the second station. Final dimension is held to 0.8015-0.8020 in. with surface finish of 16-micro-inch (rms).

Following honing gears go through a washer, then by gravity track to a storage unit. This feeds gears on demand to the first of two Blanchard 16-A2 rotary surface grinders. Featuring automatic loading and unloading, a "first" for this kind of equipment, the first machine grinds and hones one face; then the gears are delivered to another storage unit for feeding to the second Blanchard grinder to grind and hone the opposite face. Both faces are lapped to a surface finish of 16-microinch (rms) the overall length at the end of the cycle being held to 1.197-1.201 in. Both faces must be parallel and square with the bore within 0.001 in. total indicator reading.

Gears are transported to another washer, then delivered by track to a storage unit with a manual diverter for feeding them to the special Illinois Tool Works gear checker. In an extremely rapid cycle this gage checks the following characteristics: Run-out, tooth-to-tooth spacing, involute, maximum lead, and size. The gage automatically sorts the gears, permitting accepted gears to go through while rejects are shunted into separate tracks for salvage.

Accepted gears then go through a sound-proof booth for a sampling

Sharonville also produces torque converters and their components. Typical of press shop equipment is this towering 1600-ton Verson transfer press. With its nine stations it is tooled to produce converter housing and covers at the rate of more than 960 pieces an hour.



check for sound using a Red Ring sound tester, Model GSR.

It may be of interest that Sharonville has a number of new types of profiling lathes for machining the various shafts. These include the well-known New Britain GF single-tool profile lathe; and Lo-Swing Model LQ profile lathe. The Lo-Swing lathe is used for facing the flange and turning the output shaft, using two tools and

completing the operation at the rate of 63 pieces an hour.

The end spline section as well as the helical gear near the center of this shaft are both produced in Michigan Tool Roto-Flo machines, the work being moved through the two stages by means of Gear-O-Mation, as illustrated. ■

This article is the third and last in a series devoted to the Sharonville Automatic Transmission Plant of the Ford Motor Co.

Fisher Body Plans Expansion At Three Michigan Plants

Fisher Body Div. of General Motors is planning expansion and modernization programs at three of its Michigan manufacturing plants. A 200,000 sq ft addition at Grand Rapids Plant 2 will permit enlargement of "cut and sew" operations. The plant supplies Chevrolet upholstery sets.

In Lansing, a 380,000 sq ft addition will accommodate the material department and added facilities for painting and other operations. Work is slated for completion by Aug. 30, 1960. The Lansing plant currently supplies bodies for Oldsmobile and

convertible bodies for Chevrolet and Pontiac.

Fisher Body also is planning to incorporate production of all Pontiac body styles in Pontiac, including the convertibles now made in Lansing. New body and paint shops will occupy 280,000 sq ft of space formerly used for metal fabrication, and new trim and cushion facilities will be set up in the present body and paint areas.

Fabricast, Central Foundry Join as a Single Division

General Motors has consolidated its Fabricast and Central Foundry divi-

sions to form one operating unit. The move puts the two GM casting groups under a single head.

James H. Smith, general manager of Central Foundry Div., will continue to head the enlarged division. Former Fabricast general manager George A. Zink will continue as manager of the two Fabricast plants in Jones Mills, Ark. and Bedford, Ind.

Central Foundry has been GM's grey iron and malleable castings source. Fabricast has supplied aluminum castings for torque converters, transmissions, camshaft gears, Diesel locomotive and engine parts, and other components.

METALS

Automobile Manufacturers May Have No More Than Two Months' Inventory of Steel at the Strike Deadline

By William F. Boericke

Slow Increase Indicated in Steel Inventories

The furious pace of steel production in the last few months raises the question of how much of the huge output is going into inventory in anticipation of a strike in July. Opinions vary. About 20 per cent of current production was once estimated to be earmarked for inventory, but so strong has been the demand, with consumers' business so good, that it is now thought that stocks are not rising. In fact, many users confess they are shipping out their products just as fast as incoming steel is received.

Deliveries are late and mills are falling down on promised schedules. Not all the steel ordered for delivery before June will actually be in users' yards as promised. Automobile manufacturers, especially with production of new cars rising more than seasonally, fear they will have no more than two months' supply of steel at the deadline.

Estimate Enough Steel for Six to Nine Weeks

As it stands now, consumers expect to have enough steel on hand to operate normally for six to nine weeks. The construction business will feel the pinch first as much of their requirements are made to individual specifications. Galvanized sheets, long a bulwark of the market, will immediately be in short supply. Some indication of this is seen in the higher-than-domestic prices that are paid for imported galvanized products in contrast with lower prices for other steel products from abroad.

Service centers are prepared to aid consumers, and it is estimated

by July 1 their warehouse stocks will be about one million tons larger than at the start of the 1956 strike. But the same can't be said for the overall situation in which steel inventories will be substantially less than in June three years ago.

Increasing Imports

In their announced policy to hold the wage and price line, steel producers have a cogent argument in pointing to the increasing volume of imports from German, Belgian, and Japanese steel mills that are offered at \$5 to \$20 a ton under U. S. prices. While as yet the total tonnage that comes in is only a small fraction of domestic consumption, the trend is undeniably up and includes a much wider range of products than last year, when wire rods, nails and fencing were competitive. Imports now include hot rolled sheets, plates, and structurals.

The movement, of course, will be accelerated by the opening of the Seaway and will affect the Midwest market as well as the Atlantic Seaboard. At the same time domestic steel exports have fallen off in the same ratio that imports increased. The cause is definitely placed on higher domestic labor costs.

Scrap Market Unchanged

Scrap prices continue depressed and mills buy sparingly. No. 1 scrap is quoted at about \$35 a ton, down \$8 since the first of the year, in the face of the biggest indicated steel production in history. However, the pattern is similar to the position of scrap in past pre-strike periods.

Domestic Copper Consumption High

Copper figures from the Copper Institute show a mixed trend. Domestic crude production was little

changed in April, indicating that output had reached a peak with all mines working at capacity. Demand from fabricators was extremely good with deliveries climbing to over 135,000 tons for the month, the highest monthly figure for two years. As a result, refined stocks at the end of April dropped 8600 tons and registered no more than 74,300 tons, representing only a 17-day supply.

On the other hand, foreign deliveries were disappointing and stocks abroad increased 19,200 tons. On a world basis, deliveries were 8700 tons less than refined production and refined stocks had increased to nearly 330,000 tons. April was the fifth consecutive month in which world refined production exceeded deliveries. In consequence, world stocks have increased 90,000 tons since last November. This does not look like a copper shortage.

Market Steady

It appears that the copper price is stymied at present. The producers are holding firm at 31½ cents a pound, with smelters quoting a half-cent more. In London copper seesaws in a narrow range around 29½ cents. This suggests that the metal can be delivered in New York at about 32½ cents, after paying the 1.7-cent tariff, freight, and handling.

There is some uneasiness about the possibility of Government sales of copper from the supplemental stockpile, although this has been officially denied at least for the present. However, in case of a run-away market following a strike at the mines in July, the Government might offer copper to relieve a scarcity, and no doubt this has dampened speculation for a higher price.

Pointing out that copper output should increase substantially in the
(Turn to page 74, please)

The Material Handling Institute's EXPOSITION OF 1959

**Technical Sessions Which Will Run Concurrently
With Forthcoming Show Will Relate to
"Breaking Through" Material Costs
for Reduced Expense and
Higher Profits**

CLEVELAND's Public Auditorium will host the 1959 Material Handling Institute's Exposition June 9th through June 12th. Held every three years, the exhibit is owned and sponsored by the Material Handling Institute, Inc., and is the only industrial material handling exposition in 1959 that is sponsored by the industry itself.

On hand will be hundreds of experts to answer the questions of the more than 30,000 expected visitors. Over 200 companies have taken exhibit space where they will display many new pieces of equipment, some for the first time.

The following pages contain brief descriptions of some of the new products which may be seen at the show. Exhibit hours are Tuesday through Thursday, 10:00 A.M. to 5:00 P.M., and 10:00 A.M. to 4:00 P.M. Friday, June 12th.

"Breakthrough" has been selected as the central

theme for the factual Technical Sessions which will run concurrently with the show. These educational meetings will relate generally to "breaking through" material handling costs to achieve lower production costs and higher profits.

Emphasis will also be placed on the areas where "breakthrough" has prime effect. This is identified by the phrase, "Managing, Engineering, Application, Techniques"—the meat of effective material handling.

These sessions are sponsored by the American Material Handling Society, Inc., with the endorsement of the Society for the Advancement of Management, and the American Society of Mechanical Engineers. All the technical sessions will be repeated each day to allow participants to attend broadly and not have to choose one meeting thereby missing another of equal importance. Following is the technical session program in full:

TECHNICAL SESSIONS

Tuesday, June 9th

9:00 A.M. to 12:15 P.M.

Wednesday, June 10th

9:00 A.M. to 12:15 P.M.

Thursday, June 11th

9:00 A.M. to 12:15 P.M.

TECHNICAL SESSION PROGRAM

TUESDAY, JUNE 9

**Society for Advancement
of Management**

MANAGEMENT

Chairmen

Warren King, Manager of Features and Departments, FACTORY, a McGraw-Hill Publication, New York, and SAM National Vice President for Material Handling; and Roy Rix, Senior Consultant, Cost and Methods Dep't., Cleveland Electric Illuminating Company.

Speaker

Fred E. Harrell, General Manager, Curtiss Wright Corp., Marquette Div., Cleveland, and SAM National Treasurer—"How to Sell Me on Material Handling."

Panel

Charles A. Thomas, Assistant Secretary, Standard Pressed Steel Co., Jenkintown, Pennsylvania — "The Type of Individual Best Suited to Carry Out Material Handling and Packaging Activities."

Jonathan L. Collens, Manager, Large Motor Division, Reliance Electric and Engineering Co., Cleveland—"What Should the Material Handling Man Know About Business Economics."

Roland W. Puder, Group Supervisor, Engineering Dept., E. I. du Pont de Nemours & Co., Wilmington, Delaware—"How Do You Pay for New Equipment . . . Lease, Rent, or Purchase?"

WEDNESDAY, JUNE 10

**The American Society
of Mechanical Engineers**

ENGINEERING

Chairman

A. T. Gaudreau, Gaud-Reau Associates, Westport, Connecticut.

Panel

M. A. Michel, Assistant Chief Engineer, Pittsburgh & Lake Erie Railroad, Pittsburgh — "Mechanized Freight Handling at Railroad Terminals."

Foster Weldon, Director of Research, Matson Navigation Co., San Francisco — "Some System Design Considerations in Containerizing Ships' Cargoes."

(Turn to page 80, please)

What's NEW at the

MATERIAL HANDLING INSTITUTE'S

1959 EXPOSITION

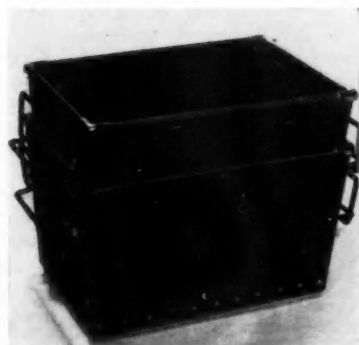
Cleveland Public Auditorium

JUNE 9-12, 1959

Stacking Tray

Three items for the economical handling of materials will be shown for the first time by the *National Vulcanized Fibre Co.*

Kennett reusable shipping containers developed to meet Category 1 re-



National nesting stacking tray

quirements of the Air Transport Association will be shown in padded, dunnage board and shock mount models.

Kennett Check-Out baskets are for use in a variety of operations for customers to carry merchandise to check-out counters.

A newly designed nesting stacking tray (pictured above), modernized for greater efficiency on roller conveyor systems has been simplified, eliminating heavy wood parts. The sides of the tray are free of any protrusion. *Booth 1912.*

Circle 29 on postcard for more data

Fork Truck Attachment

An attachment that will fit any standard fork lift truck and permit it to load and unload palletized or similarly packed material onto storage racks sideways from the lift truck will be featured in the *Equipment Manufacturing, Inc.* exhibit.

The side transfer system replaces the lifting forks on the truck and consists of a pair of heavy steel forks moving sideways across the front of the truck.

Hydraulic action is provided by connecting hose lines to the unit from the truck hydraulic systems. A steel

plate provides the track on which rollers carry the load as the forks move. *Booth 2022.*

Circle 30 on postcard for more data

Electric Motors

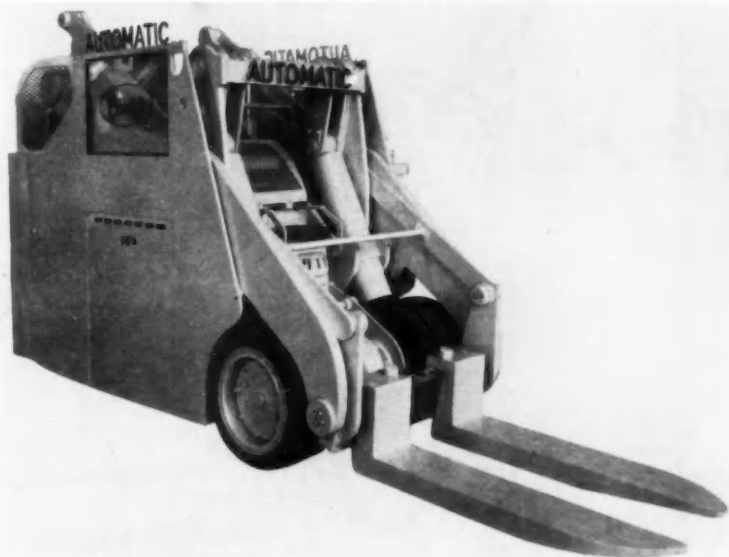
Electric motors specifically designed for material handling applications including hydraulic pump motors, hoist motors, brake motors, and gear motors will be featured in the *Doerr* display.

A mechanical variable speed trans-

mission will be demonstrated, as well as an electronically controlled adjustable speed drive. Motors in the horsepower range of from 1/20 to 10 hp will also be shown. *Doerr Electric Corp. Booth 2300.*

Circle 31 on postcard for more data

Lift Truck in Capacities From 12,000 to 15,000 Lb



Elbolift industrial truck has a 10 ft lift with an overall height of 80 in.

The Elbolift, built in capacities from 12,000 to 15,000 lb has a 10 ft lift with an overall height of 80 in.

This mastless truck, which may be seen in the *Automatic* booth, permits operation in and out of 78 in. boxcar doors with a 15,000 lb steel coil on a 52 in. square pallet.

It has been used for loading flat bed over-the-road trailers which require exact positioning of the coil in

the center of the trailer bed. This is accomplished in one operation since the Elbolift's drive wheels fit easily under the flat bed of the trailer, thus reducing positioning and considerable maneuvering.

Special attachments can be added to the unit which will convert it to a ram truck. *Automatic Transportation Co. Booths 1001, 600, 707.*

Circle 32 on postcard for more data

What's **NEW** at the

MATERIAL HANDLING INSTITUTE'S **1959 EXPOSITION**

CLEVELAND PUBLIC AUDITORIUM

JUNE 9-12, 1959

Handling Techniques

Four effective handling techniques will be depicted and enacted at the Lewis-Sheppard booth—specially engineered equipment for specialized handling problems, a complete materials handling line of equipment, job engineered equipment installations to save space and cut costs, and new products and new developments.

Of special interest are three new materials handling developments to be shown for the first time. These

FOR ADDITIONAL INFORMATION
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items include the Sit-Drive Model "C" electric fork lift truck, the HPF hand pallet truck, plus a new 24 volt Model MN narrow aisle tiering truck. *Lewis-Sheppard Products, Inc. Booths 1304, 200.*

Circle 33 on postcard for more data



Hyster Spacesaver 40 featuring Monotrol control which eliminates hand lever

Lift Truck Has 4000 Lb Capacity at 24-in. Load Center

Shown here is the new Spacesaver 40, representative of the series of lift trucks to be displayed in the *Hyster Co.* booth.

Maneuverability, "human engineered" design, and availability of the new Monotrol control system are featured throughout the line. Capacity of this unit is 4000 lb at a 24-in load.

The Monotrol control system eliminates the hand lever for control of the Power-Shift Hystamatic transmissions. It features forward-reverse selection and throttle combined in a single foot pedal and automatic parking brake.

Other Hyster trucks at the show include cushion-tired models of 3000

to 5000 lb capacity; pneumatic-tire models of 12,000 to 40,000 lb capacity, a new 4-wheel drive, 20,000 pound truck. *Booths 1601, 1402, 1022.*

Circle 34 on postcard for more data

Gasoline-Electric Cranes

Various types of gasoline-electric cranes will be displayed in the Coles booth.

Among these will be the 12-ton rail mounted crane, the 30-ton self-propelled mobile crane, the 15-ton truck mounted crane, the 11-ton self-propelled unit, and the 5-ton self-propelled crane.

All of the above will be Coles gasoline-electric cranes, in addition, the company will show a 3-ton hydraulic crane. This will be a partial slewing unit designed to lift three tons. It has a travel speed of 22 to 25 mph and will be on display in an outside booth. *Coles Cranes, Inc. Booths 1501, 1606.*

Circle 35 on postcard for more data

Swing Boom Crane

The Silent Hoist all-hydraulic Krane Kar mobile swing boom crane Model FAY with 360 degrees full revolving boom may be seen in the Silent Hoist display.

Also on display will be the Silent Hoist fork Liftruk Model FK30 of 60,000 lb capacity which is said to be the largest unit of its kind in the United States. This unit includes as standard equipment electric starting and lighting, oil bath air cleaner, oil filter, fuel tank, horn, one adjustable seat, engine governor, manual of operating and lubrication instructions and parts list. *Silent Hoist & Crane Co., Inc. Booth 1040.*

Circle 36 on postcard for more data

Lift Truck Equipment

Fork lift truck equipment used by the aircraft industry will be on exhibit in the Allis-Chalmers booth.

Operating on LP gas, the model FT30-24 fork lift truck has many uses in and around aircraft plants. Handling specially designed four-wheel dollies made for jet engine users and transporting heavy-duty body jacks for use in readying global bombers for test flight are but several uses to which Allis-Chalmers fork lift units have been applied. *Allis-Chalmers Mfg. Co. Booth 1010.*

Circle 37 on postcard for more data

Overhead Handling Devices

The Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co. will exhibit a complete line of overhead materials handling equipment in operation.

The booth will be covered by tramrail hoisting and conveying equipment supported on a special steel structure. The display will include manually-operated and power-driven overhead tramrail cranes, carriers and hoists. An automatic system will illustrate automatic operation of both cranes and carriers, as well as automatic handling from one elevation to another. Cleveland Crane's line of electrification for cranes, runways and overhead handling systems will also be shown. *Booth 100.*

Circle 38 on postcard for more data

Trolley Hoists

Shaw-Box Crane & Hoist Div. of Manning Maxwell & Moore, Inc. will exhibit two new lines of light weight "Budgit" aluminum army type trolley hoists. One line (shown) is hand geared and includes models with capacities from one through ten tons. The other features push-type trolley hoists ranging from 1/4 ton capacity through ten tons.

All models combine the high-lift ad-



Manning "Budgit" trolley hoist

vantage of low headroom requirements with lightness and ruggedness. *Booth 1056.*

Circle 39 on postcard for more data

Portable Round Steel Strapping Machine

U. S. Steel will feature a lightweight power operated round steel strapping machine that, in one operation, tensions, ties and cuts round steel strapping for virtually any size package. Designated the Model 13, the machine was designed as a portable power driven unit which would minimize operator fatigue. The unit weighs 20 lb and measures 11 by 7 by 6 1/4 in. It can be held by one operator or suspended from a simple counter-balancing mechanism. It uses round steel strapping directly from a coil without special strap preparation. The operation can be accomplished in three seconds on many packages. (United States Steel Corp. Booth 2202).

Circle 40 on postcard for more data



Rubber Mounted Crane

A rubber mounted crane featuring travel speeds of up to 18 mph and lifting capacity of up to 25 tons will be on display in the Koehring Co. booth.

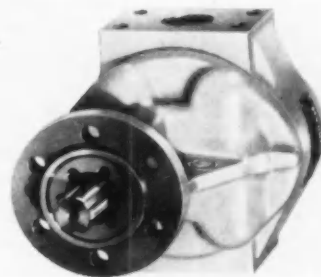
Known as the Koehring 3-5 "Cruiser" crane, its "roll-out" outriggers have screw jacks and pedestals as standard equipment. One man controls all operations while traveling or on the job. Booms up to 100 ft can be used on this three-axle unit. Safety boom-limit stops are standard equipment, as is power boom lowering. Fast, two-man boom length changes are possible because of the combination pin-pad boom joints. Belted pad connections can be used for bucket work where swing stress and strains are encountered. Brakes on all three axles are air-controlled and can be locked for digging. *Booth 1401.*

Circle 41 on postcard for more data

Sectional Control Valve

Two new products that will be exhibited by the Hydreco Div. of the

New York Air Brake Co. are a high pressure gear pump and a sectional type control valve. Both of these products are designed for industrial trucks



Hydreco V34 series valve designed for 20 gpm at 2000 psi

and other material handling applications.

The V34 series valve illustrated is designed for 20 gpm at 2000 psi. It has a basic two plunger section, but additional add-on sections can be added in the field as accessory equipment is installed.

The 2000A series Hydreco pump is rated from 10 to 25 gpm at 2000 psi for mobile equipment. *Booth 1124.*

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What's **NEW** at the

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Exhaust Purifiers

Oxy-Catalyst exhaust purifiers which kill dangerous carbon monoxide fumes, and odors from gasoline, LP gas and Diesel-powered equipment may be seen in the Oxy-Catalyst exhibit.

All Oxy-Catalyst purifiers are made of sturdy pressed steel parts, pipe, castings and fittings. They are welded, riveted and assembled for easy installation and maintenance. The connecting arrangements supplied with each apparatus serve to transport the exhaust gases to the catalytic exhaust purifier without appreciable friction of flow. Each comes complete with installation instructions and service notes. *Oxy-Catalyst, Inc. Booth A-1010.*

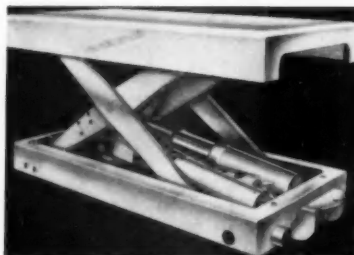
Circle 43 on postcard for more data

Lift Table

The L-12, a lift table with 12,000 lb capacity, highest in the company's L, or single scissor series, will be seen in the Southworth display.

The table is a rugged, hydraulic

powered scissor-type load lifting and work positioning device. By keeping



Southworth Model L-12 lift table

load level always at proper working height this table increases the speed of sheet feeding from skid or palletized loads. It reduces lifting strain and handling time in sorting, counting, inspecting and repiling. Incorporated in conveyor systems, it facilitates the handling of parts, tote boxes, cartons, etc., at level changes. *Southworth Machine Co. Booth 2303.*

Circle 44 on postcard for more data

Towline Carts

Dragline carts, designed for automatic switching and safety, with pressure sensitive bumpers will be shown.

These bumper mechanisms were designed for: automatic switching from one tow line to another and automatic dispatching of tow line trucks from position to position, automatic stopping and/or accumulation of tow line trucks on a moving tow line conveyor and automatic engagement of the truck to the tow line when desired. Also for safety to personnel and reduced damage to material and equipment. *SI Handling Systems, Inc. Booth 1817.*

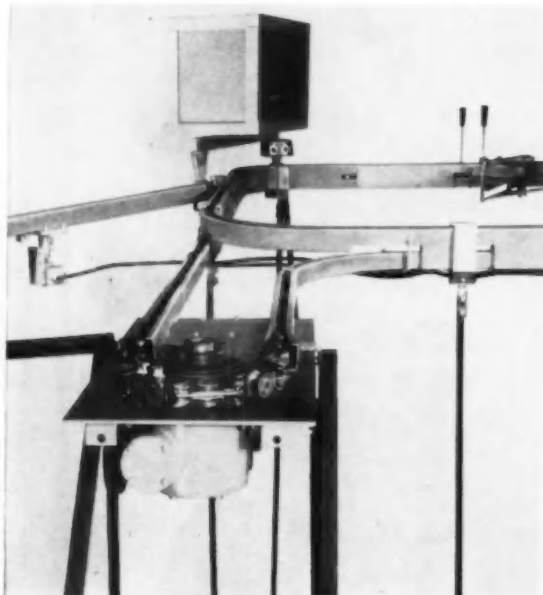
Circle 46 on postcard for more data

Industrial Trucks

Nine electric powered industrial trucks will be exhibited at the show by the *Elwell-Parker Electric Co.*

Outstanding among the trucks to be demonstrated will be the 3000 lb capacity fork truck. Named F-48T3, the new model features an extra short wheel base. Another important feature of the 71 in. high truck is the special low operator seat designed to keep the operator's head below the top of the uprights, thus, providing maximum safety during operations in low headroom areas such as covered carriers, tunnels, basements and the

Power and Free Overhead Conveyor Systems



"Power-Flex" is a power and free overhead conveyor system. Designed to handle loads up to 600 lb per work carrier, it introduces savings in investment and operation. A feature of the system is the Telematic Route selector dispatch head which can be furnished with each carrier. The two route selector dials on the head can be set to guide a carrier to any one of 80 stations. Power-Flex is for transportation applications involving storage banks, work stations, and related handling. It may be seen in the (Columbus McKinnon Chain Corp.) display (Booth 1922).

Circle 45 on postcard for more data



Elwell-Parker 3000 lb capacity lift truck

like. The key to the truck's maneuverability is a 36 in. wheelbase which enables it to make right angle turns in a 58 in. wide aisle and, to right angle stack from a 73 1/4 in. aisle. *Booth 1000.*

Circle 47 on postcard for more data

Handling Equipment

Vanguard Engineering Co will exhibit various pieces of handling equipment. Among these will be a counterbalanced mobile floor crane, the Aero Crane Series 400. This unit has an adjustable boom with the hook reaching as far as 48 in. beyond the front edge of the truck.

The Hydro-Boom, another unit to be on display, features a telescopic boom. The operator can position work loads with machine tool accuracy to within 1/100 of an in. in vertical, longitudinal, and cross-wise direction of travel. Capacity at maximum boom extension is 1500 lb; with boom retracted, 2500 lb.

Another unit on display will be the mobile work shop. Called the Shop-Van, this unit is a self-propelled, mobile work shop, designed for maximum usefulness in maintenance, repair and overhead assembly. Booth 2021.

Circle 48 on postcard for more data

Hydro-Pneumatic Accumulator

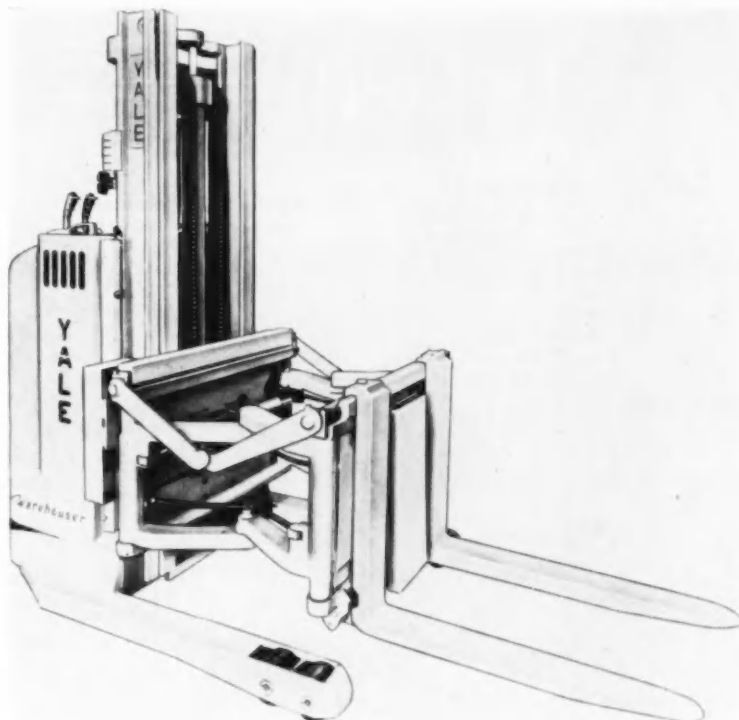
The Greerolator, a specially designed Greer hydro-pneumatic accumulator for use on lift trucks, bucket loaders, tractors, and other material handling equipment, will be shown.

The Greerolator absorbs and cushions shock on all types of hydraulically operated fork lift trucks.

The flexible rubber bag in the steel



Greerolator hydro-pneumatic accumulator



Yale & Towne Extend-A-Load and straddle stacker model with 24 volt power

Narrow Aisle Lift Truck Features 24 Volt Power

Extend-A-Load and straddle stacker models of a new Warehouse, narrow aisle, electric powered lift truck line with 24 volt power will be shown by Yale.

The new trucks are built in 2000, 3000 and 4000 lb capacity models all of which will work comfortably with normal loads in aisles less than six feet in width.

Without changing the length of the truck, the 24 volt battery provides

fast lift and travel. Unitized construction of the frame, chassis, outrigger legs and channels makes the truck rugged and stable and keeps it on the job longer.

The pantograph extending device has been designed to allow the scissors action mechanism to move parallel to the ground and fold almost within the mast. *The Yale & Towne Mfg. Co. Booths 1110, 1408, 1115, 1603.*

Circle 50 on postcard for more data

shell is precharged with gas to a pressure determined by working pressures and loads handled. The pump of the truck's hydraulic system forces oil into the shell; the gas bag compresses to balance line pressure. Then, any sudden impact at the fork forces oil to escape into the Greerolator. Shock is absorbed by the compression of the flexible gas filled bag. *Greer Hydraulics, Inc. Booth 2308.*

Circle 49 on postcard for more data

Pump Products

The Vickers display will feature a line of pump products designed for

use with materials handling equipment.

Called the "High Performance" line, these pumps feature new compact design and vane construction to assure efficient operation at increased speeds and pressures. All wearing parts of the pumps are incorporated in one replaceable cartridge enabling easy field replacement without removing the pump from its mount.

The first series in the new line is available in 12, 14, and 17 gpm sizes and the second series comes in 21, 25, and 30 gpm sizes. The third is available in 35, 42, and 50 gpm sizes. *Vickers, Inc. Booth 1427.*

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What's **NEW** at the

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CLEVELAND PUBLIC AUDITORIUM

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Conveyor Equipment

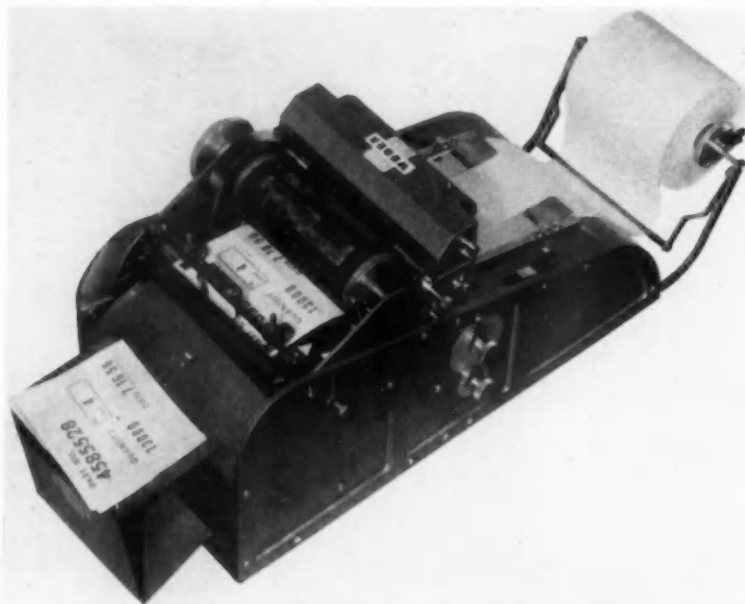
New material handling containers, to be used in conjunction with a line of lifter-dumpers, will be displayed by Essex.

A specially-fitted dumper used to lift and dump small metal parts on a conveyor belt prior to inspection and sorting and material containers easily placed in the dumper, whether stationary or mobile, by hand or fork

truck will also be seen. Electrically or hydraulically powered, plus push-button control gives positive action and the unit can be stopped anywhere. *Essex Conveyors, Inc. Booth 1916.*

Circle 52 on postcard for more data

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Weber Dual-80 label printing machine cuts to size and stacks labels automatically

Label Printing Machine Prints From Mat or Drum

Dual-80 Label Printing Machine prints from either a rubber mat with changeable rubber type or stencil drum. It counts from a pre-set counter, cuts to size and stacks labels automatically at the rate of 105 per minute. Label stock includes gummed,

ungummed, or pressure sensitive in any size from 1/2 by 2 to 4 1/4 by 6 in. The machine requires 9 by 20 in. of table space, weighs 44 lb, and never needs cleaning. *Weber Marking Systems. Booth 2013.*

Circle 53 on postcard for more data

Bulk Handling Devices

Tote System, Inc. will display Tote Bins, the heart of the hermetically-sealed Tote system of bulk ma-

terial handling which offers flexible automation to bulk material processors and users.

Tote bins serve as shipping con-

tainers, storage units and discharge hoppers, the latter in conjunction with Tote tilt discharge mechanisms, also to be displayed.

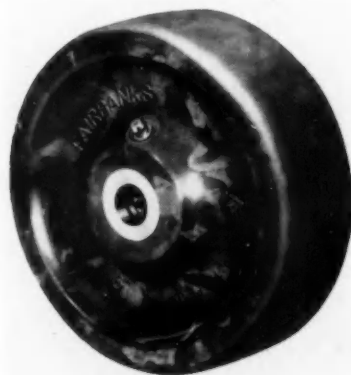
The system is in use throughout the country, handling everything from cement to resins to powdered milk, vitamins and soluble coffee. *Booth 1514.*

Circle 54 on postcard for more data

All-Plastic Wheels

"Lamilon" all-plastic wheels and a heavy duty lift jack platform truck will be shown in the Fairbanks display.

The "Lamilon" wheels (illustrated) which are a polyester resin with nylon reinforcing, have a high load capacity. They will not damage concrete floors nor mark wood floors and they have a high impact strength and abrasion resistance. They are not affected by oils, greases, water and other chemicals that might be found on floors of industrial plants. They are made



Fairbanks "Lamilon" all-plastic wheels

from 3 through 12 in. with a selection of bores available to fit most common axle sizes.

The Series 580 heavy duty lift jack platform trucks provide for handling material subject to temporary storage; such as, raw material and parts. *The Fairbanks Co. Booth 2107.*

Circle 55 on postcard for more data

AUTOMOTIVE INDUSTRIES . . .

*Is your News Magazine of
Automotive and Aviation*

MANUFACTURING

NEW**PRODUCTION
and PLANT****EQUIPMENT**

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Tensile Testers

A FAMILY of portable tensile testers has been developed by *Steel City Testing Machines, Inc.*

These testers are not dependent on outside power of any kind, since the load is applied manually by rotating a knurled knob. They weigh only 36 lb, and the applied load is measured by a trapped oil system.

Circle 56 on postcard for more data

Rotary Marking Machine

A ROTARY marking machine with a 14 in. stroke, air operated from standard 75 psi or greater plant air, for marking parts, products and materials, at a speed of 1500 or more marked parts per hour, is offered by the *Acromark Co.*

Designated as the Acromark Model No. 9A-14, the machine utilizes flat dies engraved with raised lettering or design to mark rings, hand-wheels,



Acromark Model 9A-14 marking machine

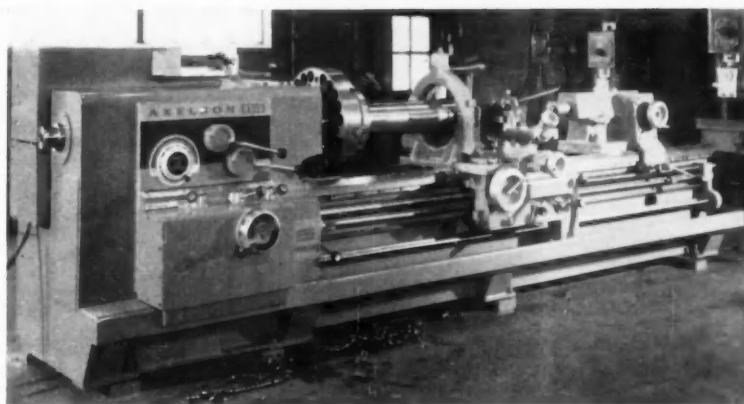
dials, rods and other cylindrical products. In operation the products to be marked are placed on a rotating mandrel or fixture and it rotates as the die passes over it impressing the mark by the "point of contact" method which actually rotates the part against the die.

Circle 57 on postcard for more data

Honing Machine

COMPLETE automation in the honing section of a cylinder sleeve production line was achieved by the use of a *BarnesdriL* Model No. 307-2 vertical type honing machine and a special fixture assembly.

By incorporating a two-spindle reciprocating head and completely automatic load and unload mechanisms on the machine, operator attendance can



Blue Chip lathe features welded steel construction, 40 spindle speeds

Lathe Line Features Welded Steel Construction

THE Clearing-Axelson "Blue Chip" lathe offers 40 spindle speeds up to 2000 rpm. A 50 hp main motor delivers torque to the spindle for heavy cuts. Rough threading and heavy interrupted cuts are handled without perceptible vibration or "chatter."

The headstock is built to the floor and is a completely independent unit containing the drive and feed units, and the electrical equipment for the machine. It also serves to mount the operating console and other devices. The bed is mounted to the side of the

headstock by a thick, extra wide flange, a unit which is as firm and rigid as any that can be practically designed. Both the bed and headstock are welded steel.

Standard gear shifting on the "Blue Chip" lathe is manual with a four position and a five position lever operating in two ranges taking care of all speed changes. However, power assisted and full power shifting are available as options. *Clearing Div., U. S. Industries, Inc.*

Circle 58 on postcard for more data

be reduced to a minimum while still maintaining production quotas.

The machine is arranged with twin cylinder hydraulic reciprocation rates from 10 to 75 fpm. Included with the reciprocating head are: Electronic hone expansion and Plugmatic automatic bore-to-bore sizing. *Barnes Drill Co.*

Circle 59 on postcard for more data

Cutting Tips

DESIGNATED Style 260 straight bore and Style 360 divergent hi-speed, a new line of tips for flame cutting with natural gas and propane was specifically designed to be used with

standard Airco 3000 and 9000 hand cutting torches, 3700 and 3800 hand cutting attachments and 4700 machine cutting torches without any additional accessories.

Tips are hard, three-seated type with improved pre-heat patterns that have a pre-heat range to satisfy practically all light and heavy requirements.

Style 260 straight bore tips are available in seven sizes for both manual and machine cutting thicknesses up to and including 12 in. Divergent hi-speed tips, Style 360, are available in eight sizes for machine cutting. *Air Reduction Sales Co., Div. of Air Reduction Co., Inc.*

Circle 60 on postcard for more data

Air-Hydraulic Hole Punching Machine



The Unipunch Model 1012, equipped with precision Unipunch gaging and tooling is for hole punching in angles, channels, extrusions and sheets plus notching operations. The press is available with 37 round punches and 74 dies with 4 Unipunch hole punching units and one Unipunch notching unit. In addition to punching round and shaped holes and notching corners and edges, this press may be used for punching extruded and countersunk holes, small louvers, and lanced holes. Small die sets may be installed for stampings. With a template, several units may be set up for making a cluster hole pattern in place of custom punches and dies. (Punch Products Corp.)

Circle 61 on postcard for more data

ing force and at the same time assures maximum flexibility and ease of control. Construction features the movement of pinch rolls and gaging roll by means of heavy duty hydraulic cylinders. Control levers actuate leak-proof pressure flow valves.

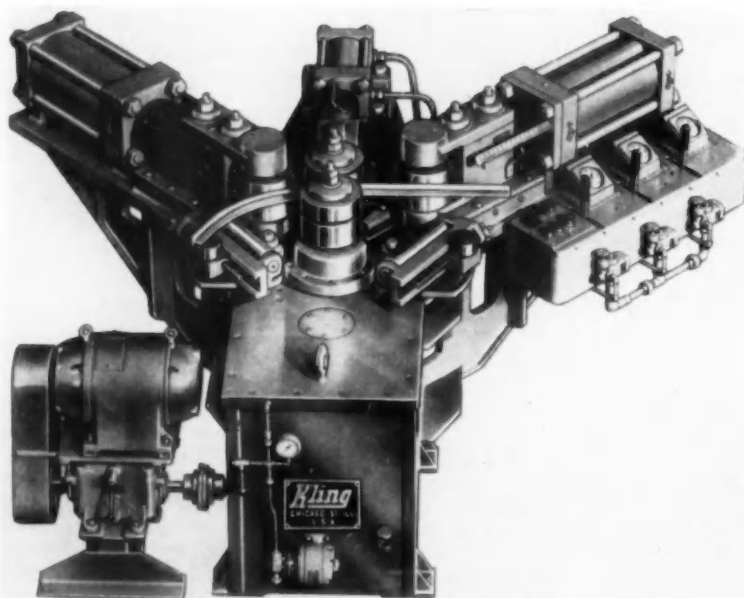
A two-stage "high-low" pressure pump enables the rolls to be brought into operation quickly, and upon contact with the work, develops full working pressure immediately. Kling Brothers Engineering Works.

Circle 62 on postcard for more data

Abrasive Cut-Off Units

ABRASIVE cut-off machines can be furnished to suit particular operations through a "building block" program announced by the Cincinnati Electrical Tool Co.

The photograph shows the abrasive cut-off head with the splash pan, splash guard (W) and mounting pad (H) for mounting vise or holding fixture. This head can be furnished with or without the splash pan mounting pad depending on the user's requirements. A precision vise for close tolerance work and air or hydraulic



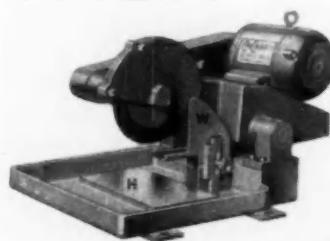
Kling Brothers horizontal hydraulic double pinch type angle roll

Horizontal Hydraulic Double Pinch Angle Roll

THIS horizontal hydraulic double pinch type angle roll and structural bending roll permits elimination of much of the flat ends in angle

bending. An operator can bend a steel section completely around the center roll.

Hydraulic pressure provides bend-



Cincinnati abrasive cut-off unit

cylinders for automatic control of head are among the features available.

The heads are equipped with either 7½ or 10 hp heavy duty motor and are arranged to use 16 by 3/32 in. abrasive cut-off wheels.

Circle 63 on postcard for more data

Automatic Transfer Line

DESIGNED by Baker Brothers, Inc., a completely automatic transfer line consecutively drills, bores, grinds and faces bearing caps for 12-cylinder truck engines. As a final step, the machine saws apart the individual elements of the cluster castings for delivery into their respective bins. Production rate is 70 parts per hour at 100 per cent efficiency.

Circle 64 on postcard for more data

Tapping Attachment

TAPMATIC CORP. has developed the high speed Tapmatic "300A" tapping attachment which is capable of continuous operation at speeds up to 2500 rpm.

Featuring an axial floating drive spindle and a supersensitive spring loaded ball clutch, the unit was designed expressly to eliminate the hazards associated with conventional tapping equipment. Friction clutches, planetary gears, lead screws have all been eliminated in this construction.



Tapmatic "300A" tapping attachment

An operator of minimum skill can produce consistently perfect threads without danger of tap breakage.

The "300A" weighs 15 oz, has a diameter of 1-27/32 in. and a length of 3 3/4 in. The rated capacity for tapping in mild steel is from #0 to #10-24.

Circle 65 on postcard for more data

Precision Machining Unit

A LOW-COST Hill numerically-controlled high-speed single-spindle precision machine that can perform a variety of drilling, milling or jigg-boring operations has been designed and built by Walter P. Hill, Inc.

The machine is suited to the manufacture of tube sheets by the heat exchanger industry, jigs and fixtures by the tool and die industry and for small lot and job-lot production by a variety of metalworking plants.

A hydraulic-powered spindle enables the machine to drill or gun-drill 3/4 in. diameter holes in steel at feeds up to 30 ipm. Ease of work loading is

provided by a hydraulic powered tilting work table. The machine is controlled by a General Electric Mark 11 universal numerical positioning control. It uses punched tape made from type-written instructions to carry out a programmed, spindle location and operation sequence. This system uses counterbalanced hydraulic cylinders and requires no servo valves.

Circle 66 on postcard for more data

Universal Joint Drillhead

FAST, easy removal of spindles, bearings and related parts are features of the cartridge type spindle plate construction available with Thriftmaster Universal joint type adjustable drill heads.

The cartridge plate provides spindle rigidity and accuracy usually found in fixed center heads while retaining the adjustable feature for application to various hole patterns. Removal of one lock screw permits the spindle, bearings and related parts to be re-

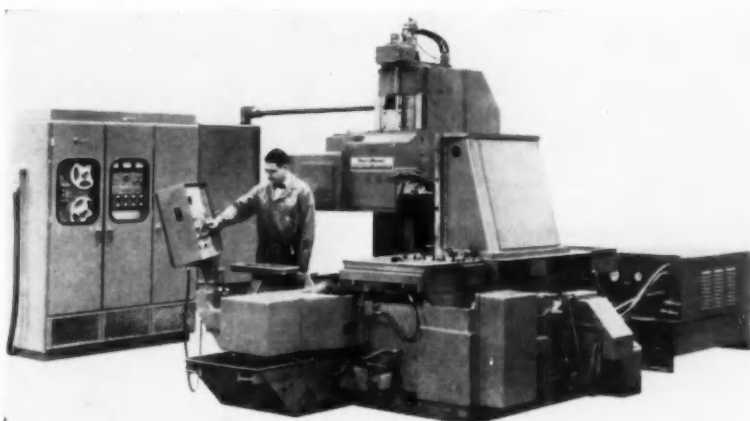
moved from the plate as a complete unit. This eliminates many of the difficulties resulting from frequent as-



Thriftmaster universal joint type adjustable drillhead

sembly and disassembly of bearings and other parts. Thriftmaster Products Corp.

Circle 67 on postcard for more data



Pratt & Whitney Numeric Keller features continuous, tape-controlled milling in three dimensions

Three Dimensional Tape-Controlled Milling Machine

CONTINUOUS automatic milling of regular and irregular shapes in three dimensions under the direction of tape-reading numerical control is accomplished by this Numeric-Keller machine.

Punched tape automatically controls the horizontal and transverse movements of the table, the vertical movement of the cutter spindle, and the feed rates. The operator is required only to push a button to start the tape, change the tooling as required, and set the spindle speeds.

The machine is capable of both heavy and delicate work under tape direction. Eighteen spindle speeds are available ranging from 40 to 3600 rpm. Table travel is 36 in. horizontal and 12 in. transverse; the vertical slide moves 22 in. Table working surface measures 48 by 30 in. Power for all three movements is furnished by a hydraulic system that generates 1500 psi and delivers 7 1/2 hp to any of the feed motors. Pratt & Whitney Co., Inc.

Circle 68 on postcard for more data

NEW

PRODUCTS

AUTOMOTIVE - AVIATION

FOR ADDITIONAL INFORMATION, please use reply card at back of issue

Turbocharger

Model T1404 turbocharger uses a one-piece precision casting of high temperature alloy GMR 235 for the turbine wheel, a radial inward flow type. The impeller on the compressor side is of a special aluminum alloy, also one piece. It is of backward



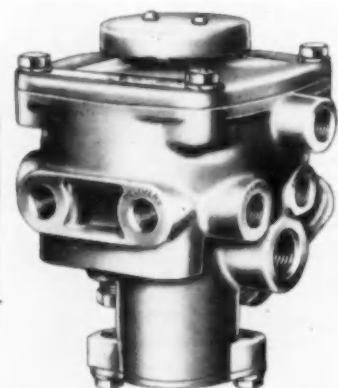
curved outward flow, semi-shrouded design.

The AiResearch turbochargers provide required output at reduced engine stress and thermal loads. These reduced loadings are the result of high aerodynamic efficiencies which provide air density at low pressures and temperatures, and corresponding low turbocharger speeds. The Garrett Corporation's AiResearch Industrial Div.

Circle 69 on postcard for more data

Relay Emergency Valve

Known as the RE-4 relay emergency valve, a new unit for trailers



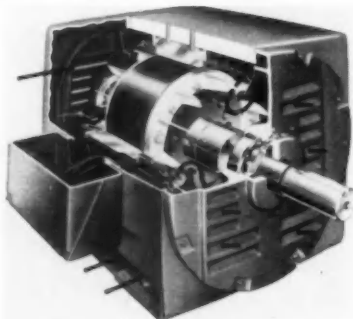
is a piston-type operated relay emergency valve. A relay piston is used to provide constant output over a wide temperature range and assure immediate pressure balance of the tractor and trailer air brake system to within 1 psi.

The RE-4 has an aluminum body and cover, weighs 4.7 lb, and is designed for remote installation or tank mounting. It is interchangeable with other relay emergency valves. Bendix-Westinghouse Automotive Air Brake Co.

Circle 70 on postcard for more data

Medium-Size Motors

AC motors, tailored to industry needs are available from General



Electric's Medium AC Motor & Generator Dept.

The "Custom 8000" general line with ratings from 100 to 600 hp features an entirely new "square look." A number of accessory kits such as splash-proof louvers or space heaters to protect a motor in damp atmospheres are also available for quick conversions in the field. The new motors withstood shock loads up to 20 G's.

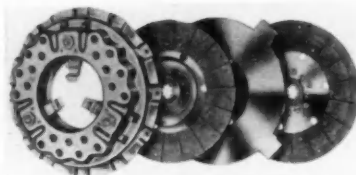
Circle 71 on postcard for more data

Two-Plate Clutch

Lipe-Rollway Corp. has introduced a 14 in. two-plate DPB direct pressure heavy-duty clutch to fulfill the requirements of heavy Diesel engines in on-highway vehicles.

Made of rugged light weight con-

struction the unit is recommended for engines developing up to 735 ft-



lb gross torque. Torque rating: static 1135 ft-lb, maximum.

The dry disk, direct pressure unit has a facing area of 428 sq-in. with unit-pressure up to 26.5 psi. Maximum release bearing load is 600 lb at full release. Friction-free and internal linkage permits mechanical efficiency.

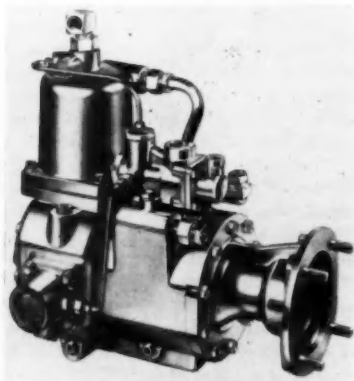
Circle 72 on postcard for more data

Rotary Compressor

The Automotive Div. of Wagner Electric Corp. has announced the development of a 12 cfm rotary drive-thru compressor for use with automotive Diesel engines.

The design of the compressor eliminates the use of thrust absorbing components, and rotary seals operate with a minimum of loading for extended life. It features a lubricating system that circulates engine oil through the compressor during the non-pumping cycle and cools the compressor between cycles by completely changing the oil in the sump.

Circle 73 on postcard for more data



*Inland "job-tailored"
Cold Rolled Sheets work better*

product: VACUUM CLEANER
TANK PART



problem:

produce a handsome vacuum cleaner tank of the upright type, designed in a silhouette for consumer eye appeal. The operation to be a single deep draw. Because of the depth of the draw and the severe shaping, a sizeable amount of breakage could result. The required draw also produced stretcher strains in the shaped tank which handicapped later finishing operations.



solution:

quality standards were met and the problem overcome by "job-tailored" Inland Cold Rolled, Drawing Quality, Aluminum Killed Steel. This steel, specifically recommended for the job, successfully took the deep draw and pattern formation required. Stretcher strains were eliminated and an excellent surface obtained for all subsequent finishing.

INLAND STEEL

30 West Monroe Street, Chicago 3, Illinois

Sales Offices: Chicago • Davenport • Detroit • Houston • Indianapolis
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*Cold
Rolled
Sheets*

News of the MACHINERY INDUSTRIES

By Charles A. Weinert

**Automatic Machine Can
Finish Grind Crankpins on
60 Crankshafts per Hour.
New Method for Deburring
Gears Handles Roughing
and Finishing Operations
in One Setup**

Automated Grinder Developed by Norton

Norton Co. has developed, and recently completed at its Worcester, Mass. plant, a seven-station crankpin grinder for processing automotive-type crankshafts. This unit is believed to be the largest and most expensive grinding machine ever built. It is 19 ft wide and 90 ft long, weighs around 135 tons, and is priced at about \$750,000.

The machine, called the Norton No. 2 unitized transfer-type automatic crankpin grinding machine, was designed to finish-grind the pins on up to 60 crankshafts per hour. There are seven grinding stations total—only six of which are normally used—connected by a transfer system. Each unit grinds a single pin on the crankshaft. Grinding, size control, gaging, and wheel truing, as well as loading and unloading, are all done automatically.

Crankshafts are brought to the grinder by a conveyor and an overhead transfer carrier equipped with two sets of hooks. As a ground shaft is removed by one set of hooks, an unground shaft is placed into the workholders of the machine by the second set of hooks. Total time that the grinding wheel is not in contact with the work during the one-minute cycle is 17 sec.

While grinding is in process, the overhead carrier picks up another unground crankshaft, deposits a ground shaft on a sliding-beam conveyor for transfer to the next station, and places the unground shaft in position over the first grinding station, ready to be lowered.

During any of the short intervals the wheel is not in contact with the work, wheel-truing can be done automatically at the end of each cycle or after a preset number of cycles.

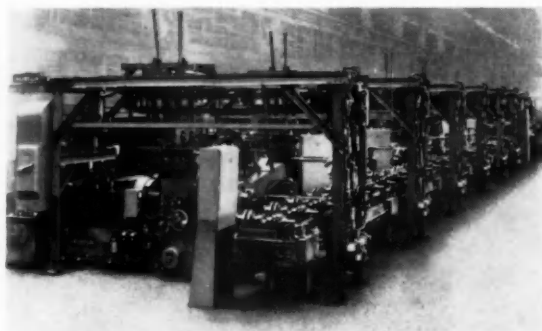
The workholders in the machine

automatically position the shafts, and the shafts do not have to be turned angularly while being transferred between the various stations. Angular location is accomplished in two steps. In the first, the shaft is roughly oriented when it is placed on the conveyor, where it is supported by one main bearing and one crankpin. The weight of the shaft turns the correct side up. The pick-up hooks are designed

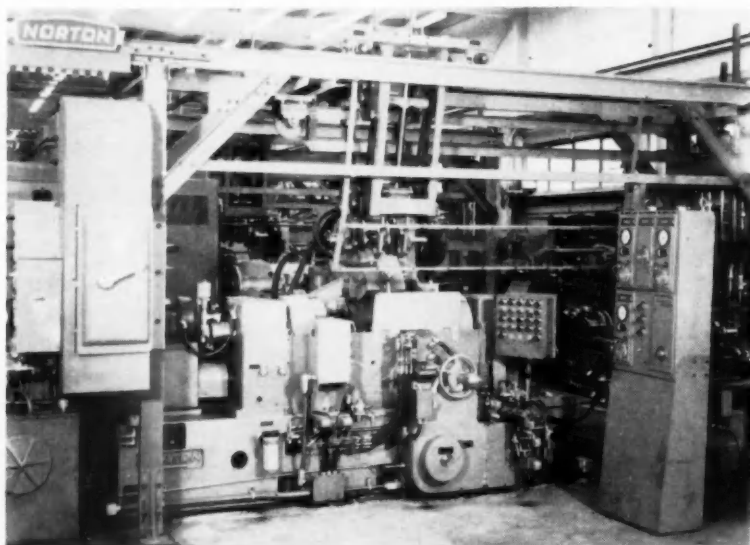
to maintain that position. When the shaft is placed in the workholders, the end pin comes to rest in a vee on a fixturing template which provides the final angular location.

For endwise positioning, an oval-shaped cam rotates between the cheeks of the pin to be ground and aligns the crankpin so that the wheel will grind an equal amount
(Turn to page 62, please)

Below is first station of Norton No. 2 transfer-type crankpin grinder, showing master control for the seven-station machine, one of the grinding machines, and one of the overhead loading and unloading carriers. At the right is the sliding-beam conveyor on which crankshafts are deposited on vee blocks for transfer to the next station.



General view of the Norton transfer-type crankpin grinder



How Perfect Circles are engineered for severe service

Precise pressure and pre-seated hard, solid chrome doubles life of rings and cylinders.

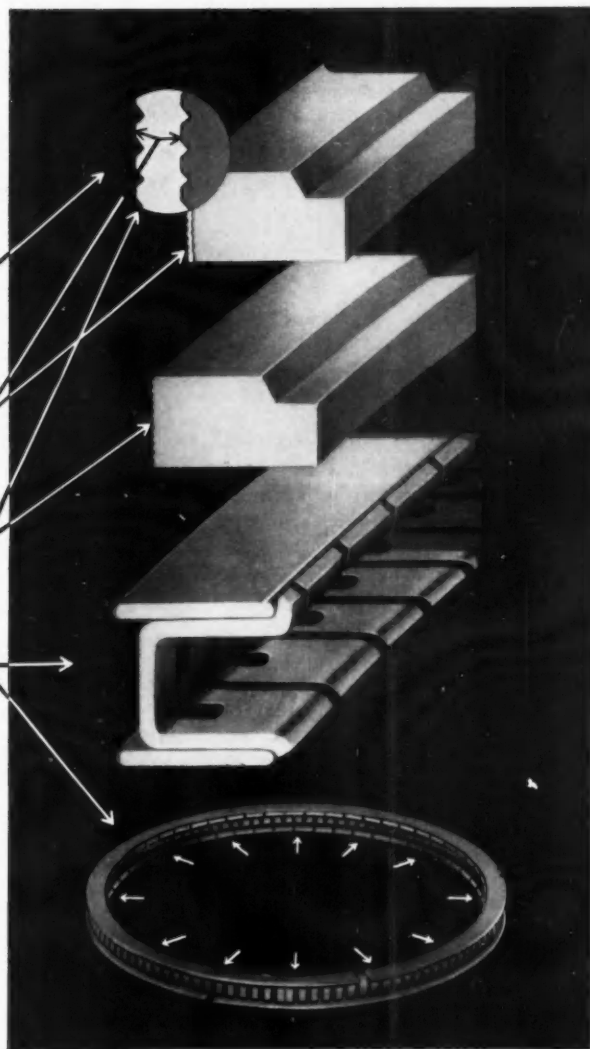
PRECISE CONTROL of correct ring pressure distribution for any particular type engine *plus* a pre-seated surface on ring face assures long life and eliminates tedious break-in period.

SOLID HARD CHROME PLATING on face of compression ring reduces the rate of wear to one-fourth that of unplated rings.

CORRECT FACE DESIGN on compression ring, tailored to specific applications, prevents blow-by and scuffing, yet provides immediate oil control.

CHROME "98" OIL RING has made high-compression history because of its ability to provide positive oil control on both vacuum and compression strokes! The "98" does not depend upon the depth or bottom of the ring groove for pressure. The rails are in constant contact with both sides of the groove and cylinder wall. The result: a ring that seals off two principal leakage paths—even after thousands of hours of service!

**SPECIFY PERFECT CIRCLES
FOR FULL POWER PROTECTION!**



PERFECT

PISTON RINGS AND



CIRCLE

POWER SERVICE PRODUCTS

Hagerstown, Indiana

Don Mills, Ontario, Canada

on each cheek. After alignment, the locator retracts, the shaft is hydraulically clamped, and the grinding cycle begins.

The machine is designed to mount 42-in. grinding wheels. The grinding cycle consists of a rapid in-feed, fast rate for shoulder grinding, slower speed for roughing followed by a four-second dwell, and a very slow in-feed for final sizing and finishing of the pin. In-feed is controlled by hydraulic valves.

Size of the workpiece is controlled by in-process gaging. When the final size is reached, air gages actuate the controls which retract the wheel slide, thus ending the grinding cycle.

Post-process gaging is done on the ground crankpin when it returns to the conveyor. Three readings on each pin are taken simultaneously; and if the part should be off tolerance, the grinding station is automatically stopped and the operator warned by signal lights. In such a case, the rest of the machine can continue to operate by by-passing the one station causing trouble.

The seventh station of the machine is a spare one. It can be used in place of any of the other stations when shut down for wheel changing, adjustment or maintenance; or as a conventional crankpin grinder with its own operator.

New Gear Deburring Method Employs Coated Abrasives

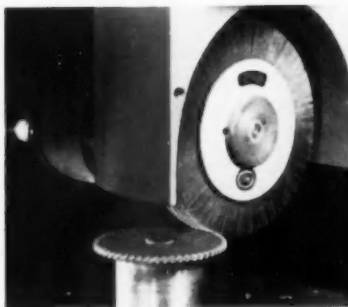
Barber-Colman Co. and Minnesota Mining & Mfg. Co., in a joint development, have come up with a new method for deburring gears which employs a specially-designed machine and coated-abrasive wheels.

The process is said to completely remove the burr around the entire tooth form; and also to permit, where required, the grinding of a controlled chamfer on the entire tooth profile. Consistency in profile from tooth to tooth, and from gear to gear, as well as protection for the gear face are other featured advantages.

Production models of the machine, made by Barber-Colman, will

employ 3M company "PG" wheels in diameters of 6 to 14 in. The initial model, the 1600, uses a 10 or 14 in. wheel and can accommodate gears up to 16 in. OD. Its wheel is driven by a three-horsepower motor, and wheel speed is 2400 rpm.

Deburring is accomplished as a formed "PG" abrasive wheel moves by hydraulic action into working position, feeds into contact with the workpiece, and retracts to the starting position at the end of a preset contact period—in an automatic cycle actuated by pushbutton. The abrasive wheel and work spindles operate in timed relationship so that the workpiece indexes one tooth for each revolution of the wheel.



This is the way the formed "PG" wheel contacts the workpiece on the Barber-Colman Model 1600 gear deburring machine. The abrasive wheel and workpiece are in a timed relationship so that the workpiece indexes one tooth for each revolution of the wheel.

The "PG" wheel consists of many radially-dispersed die-cut leaves of coated abrasive, cemented at their inner ends to make a wheel with a solid hub and a flexible periphery. Forming, or dressing, of the wheel is done in the user's plant on the deburring machine. It is accomplished by cementing an abrasive disk to the face of a workpiece and cutting away the overhanging part of the disk to expose the gear teeth. The wheel is then placed into contact with the "forming tool" with the backs of the abrasive leaves against the abrasive disk on the workpiece, and run in this reverse direction until the proper form depth is imparted to the wheel.

The setup on the machine also allows the use of an oscillating "PG" wheel which requires no forming. While in this case the wheel has several annular slots for

flexibility, the wheel and workpiece need not be in a timed relationship. Finish with the oscillating wheel is said to be about the same, except for producing a slightly larger, less precise chamfer than does the formed wheel.

For use where very heavy burrs have to be removed, the machine is equipped with an attachment which holds a tool for turning off the heavy portion of the burr. This turning tool is so arranged that it removes the heavy burr ahead of the "PG" wheel, thereby handling both roughing and finishing operations in one setup.

Machine Tool Builder Urges More Automation

Ralph Cross, executive vice-president of The Cross Co., recently outlined a program for adopting automation in metalworking plants. The occasion was the National Production Engineering Conference of the American Society of Mechanical Engineers, held in Detroit, Mich., on May 12-14.

In presenting his plan, Mr. Cross contended that U. S. industry is not automating fast enough. Manufacturers in this country must accelerate the use of automation, he stated, if they expect to keep up with the rest of the world and halt the growing loss of American markets. Automation is essential, he explained, to boost the productivity needed to offset the serious wage and price differentials of foreign manufacturers.

Mr. Cross strongly recommended top management participation as a means of realizing the full potential of automated methods. He feels that top management must monitor, direct and steer the entire effort if the objectives are to be fully achieved. Other factors include the need for good organization of technicians, phasing of the project, continued research, progressive depreciation policies, and good cost accounting.

In addition to his plan for speeding up the use of automation, Mr. Cross called upon industry to persuade Government reform of "antiquated" depreciation and tax laws relating to capital investments, to enable the U. S. to grow on a par with other countries. ■



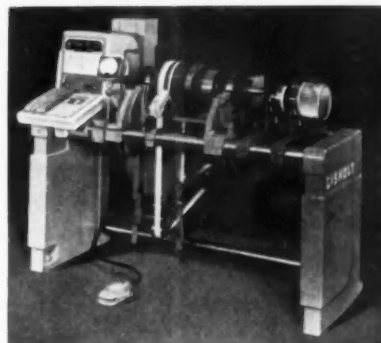
A good buyer doesn't buy by ear...

Static and dynamic balancing is a critical quality-control operation. Balancing tolerances in rotating parts must be held to eliminate destructive vibrations and assure long, trouble-free performance in the field. If a balancer fails to provide these accuracy assurances, it's a bad investment at any price.

Words alone are not enough, especially when it comes to buying a balancer. Instead of claims, demand to see proof of the machine's ability to meet the close tolerances your work requires. Thoroughly test and compare competitive machines—on your own work—*before* you buy!

Gisholt gives you proof before you buy. We invite you to see your work balanced on any of the Gisholt Balancers...and to watch them go through a series of scientific balancing tests in our plant...to prove that your tolerances will be met economically and efficiently *before* you buy!

Free book on balancer testing. The tests that Gisholt will conduct to verify accuracy and production claims are covered in a new booklet, "Performance Tests for Balancing Machines." It's designed to help you determine your balancing equipment needs and to simplify the job of comparing competitive machines. Remember, no reliable supplier of balancing machines will refuse to cooperate in these tests and you will have complete assurance that your requirements will be met—*before* you buy! Ask your Gisholt Representative or write us for your free copy.



The Gisholt 31S Balancer shown here accommodates an extremely wide range of work-piece weights and diameters...is ideal for production or job-lot operations. Capable of accurately measuring and locating vibratory movements as small as .000025" in one or two correction planes, direct reading amount meter provides quick answers in terms of correction method most suitable to work at hand—for added savings.



GISHOLT

MACHINE COMPANY

Madison 10, Wisconsin

**Investigate Gisholt's Extended
Payment and Leasing Plans**

Turret Lathes • Automatic Lathes • Balancers • Superfinishers • Threading Lathes • Factory-Rebuilt Machines with New-Machine Guarantee

AUTOMOTIVE INDUSTRIES, June 1, 1959

Circle 123 on Inquiry Card, for more Data

63

AUTOMATION NEWS REPORT

AUTOMATIC CONTROLS

PRODUCTION—VEHICLES—AIRCRAFT

By Samuel Cummings

NEW GENERATION OF ROBOTS

A new generation of electronic robots that bears an amazing resemblance to the robots of science fiction is being developed by industry to do jobs too dangerous for men to handle.

The new robots—advanced versions of the master-slave devices developed during World War II—can feel, hear and even see. They are designed to perform a variety of functions—from handling deadly radioactive materials to working on the ocean floor.

HANDYMAN

General Electric Co. announced it has developed a robot that will act as a "master mechanic" on an atomic aircraft powerplant. The company said the machine, which it calls Handyman, is the first of its kind to simulate the clutching motions of the human hand.

Handyman's system is composed of five units—master, slave, electronic console, and two hydraulic pump systems that circulate hydraulic fluid through both master and slave units.

Handyman's brain is an analog computer, which does the complex figuring needed for automatic counterbalancing. Signals between master and slave units are transmitted through 56 "servo loops."

Handyman's dexterity rivals that of a human being, according to GE scientists. It bends its arms and folds and unfolds its powerful hands to manipulate objects of almost any shape. Its arms have a

B&W nuclear specialist seated at a remote control console follows movements of a robot tow-truck on closed circuit TV screen. Work is being carried on at a B&W facility set up to develop an ultrasonically controlled maintenance fleet of robots that will operate in "hot" areas.



9-ft reach. When extended, each hand can lift 75 lb.

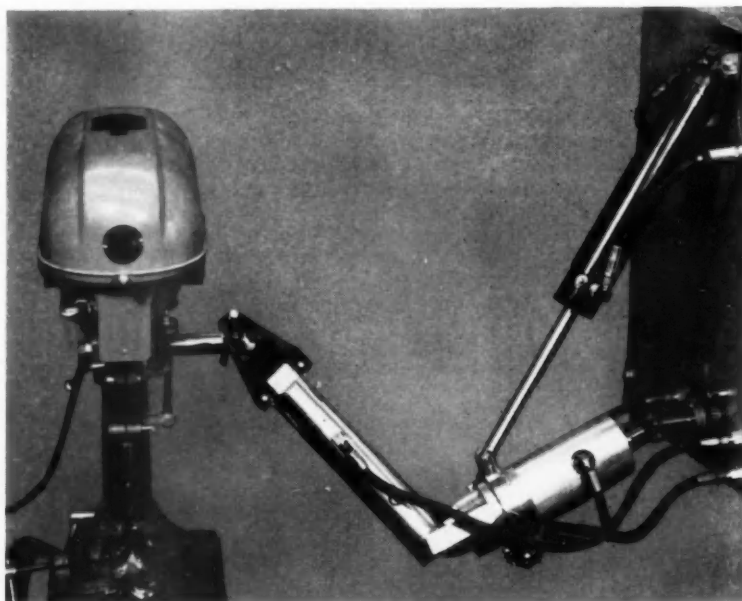
Using the jointed thumb and forefinger, the GE robot can hammer a nail into a board, place one object inside another, unscrew a bolt, and even twirl a hula hoop.

GE scientists designed 10 basic motions into each arm and hand. Compounded, they make possible an almost infinite range of move-

ments, all dictated by a master unit outside the danger area.

The operator with his own arms and hands inside the master unit goes through the motions he wants the robot to perform—and Handyman duplicates every movement simultaneously. In addition, the operator feels what Handyman feels and hears what it hears.

(Turn to page 73, please)



Showing off his muscles, a Mobot manipulator bends an elbow to the task of operating a drill press. Machine's actions are directed by human operator who can view Mobot's work on closed TV circuit.

ECONOMY AND STRENGTH are outstanding characteristics of these pressure plates for automotive transmissions. These sintered metal parts are another typical result of the effective liaison between Moraine Products and customer in product design. They also confirm Moraine Products' talent for producing—in quantity and on time—parts that can take the punishment of the most demanding operating conditions.



Parts shown $\frac{1}{3}$ actual size

Vital parts for Automotive Progress



Moraine Products

Division of General Motors, Dayton, Ohio

• • INDUSTRY STATISTICS • •

WEEKLY U.S. MOTOR VEHICLE PRODUCTION

As reported by the Automobile Manufacturers Association

Make	Weeks Ending		Year to Date	
	May 16	May 9	1959	1958
PASSENGER CAR PRODUCTION				
Total—American Motors	9,413	8,703	161,152	66,716
Chrysler	2,012	2,049	32,455	22,509
De Soto	1,245	1,166	23,997	15,327
Dodge	3,913	3,821	72,292	40,526
Imperial	418	315	9,233	6,369
Plymouth	12,366	12,140	162,413	159,169
Total—Chrysler Corp.	19,954	19,491	320,290	239,900
Edsel	744	747	19,375	6,099
Ford	34,331	34,943	616,794	396,806
Lincoln	522	697	13,240	12,715
Mercury	3,057	3,057	64,035	50,075
Total—Ford Motor Co.	38,654	39,444	713,444	465,695
Buick	4,338	4,169	115,006	109,322
Cadillac	3,376	3,387	68,460	59,678
Chevrolet	36,171	36,844	672,976	553,108
Oldsmobile	9,201	9,022	171,574	144,285
Pontiac	11,487	11,002	180,663	99,112
Total—General Motors Corp.	64,573	64,524	1,208,699	965,485
Total—Studebaker-Packard Corp.	3,294	2,602	71,433	14,149*
Checker Cab	162	127	2,237	1,626
Total—Passenger Cars	136,050	134,891	2,477,255	1,753,571
TRUCK AND BUS PRODUCTION				
Chevrolet	8,753	8,922	158,533	114,966
G. M. C.	1,928	1,903	35,144	24,670
Diamond T	154	121	2,559	2,117
Diveo	80	80	1,444	1,164
Dodge and Fargo	1,480	1,616	33,394	22,031
Ford	7,800	7,767	130,817	88,690
F. W. D.	23	25	380	565
International	3,216	3,300	54,765	40,048
Mack	401	341	6,731	5,884
Studebaker	125	121	5,480	4,330
White	414	452	7,453	7,043
Willys	2,463	2,769	45,534	31,118
Other Trucks	65	65	1,253	1,206
Total—Trucks	26,902	27,482	483,457	343,832
Buses	90	75	1,036	1,440
Total—Motor Vehicles	163,042	162,448	2,961,748	2,098,843

* Includes Packard.

NEW FOREIGN CAR REGISTRATIONS

March

1959	1958
Volkswagen	8,739
Renault	6,401
English Ford	3,986
Simca	3,681
Opel	3,293
Fiat	3,050
Hillman	2,489
Triumph	1,951
Vauxhall	1,731
Volvo	1,628
All Others	11,979
Total	48,926

1958	1957
Volkswagen	7,557
Renault	2,985
English Ford	2,289
Hillman	1,304
Simca	1,126
MG	1,055
Triumph	1,048
Fiat	1,047
Opel	967
Metropolitan	930
All Others	6,015
Total	26,323

First Three Months

1959	1958
Volkswagen	22,647
Renault	16,548
English Ford	10,267
Simca	8,769
Opel	8,216
Fiat	8,094
Hillman	6,432
Vauxhall	4,864
Triumph	4,711
Volvo	4,344
All Others	29,952
Total	124,864

1958	1957
Volkswagen	18,652
Renault	7,448
English Ford	5,453
Hillman	3,228
Simca	2,883
MG	2,756
Fiat	2,649
Triumph	2,449
Opel	2,420
Metropolitan	2,250
All Others	15,580
Total	65,768

RETAIL CAR SALES BY PRICE GROUPS*

FEBRUARY, 1959

Price Group	Units†	% of Total	Dollars	% of Total
Under \$2,500	102,702	26.77	\$ 238,056,754	21.99
\$2,501 to \$3,500	239,620	62.45	660,481,164	61.00
\$3,501 to \$4,500	25,858	6.74	96,741,520	9.12
Over \$4,500	15,461	4.04	65,453,332	7.89
Total	383,661	100.00	\$1,062,732,770	100.00

*—Calculated on basis of new car registrations, as reported by R. L. Polk & Co., in conjunction with advertised delivered price at factory of four door sedan or equivalent model. Does not include transportation charges or extra equipment.

†—New registrations of American made cars only. Does not include imported foreign cars.

1959 NEW REGISTRATIONS

Arranged in Descending Order According to the Three Months 1959 Totals

NEW CARS

Make	March 1959		February 1959		March 1958		Three Months 1959		Three Months 1958	
	1959	1958	1959	1958	1959	1958	1959	1958	1959	1958
Chevrolet	119,992	106,506	109,170	333,041	305,679					
Ford	122,020	103,498	96,568	322,019	238,237					
Oldsmobile	31,980	27,732	20,555	87,820	83,033					
Pontiac	32,342	27,349	21,404	85,180	61,613					
Plymouth	26,115	20,600	33,738	73,248	93,745					
Rambler	27,449	21,856	12,237	70,342	29,959					
Buick	22,689	20,828	24,566	65,142	73,232					
Cadillac	12,901	11,906	11,074	36,796	32,606					
Mercury	12,897	11,084	12,633	35,117	32,298					
Studebaker	11,651	9,808	3,319	30,846	9,755					
Dodge	10,473	7,655	11,630	27,990	33,103					
Chrysler	4,999	3,812	5,720	12,800	16,555					
Edsel	4,187	3,936	3,320	11,733	11,931					
De Soto	3,517	2,841	4,641	9,733	13,610					
Lincoln	2,657	2,503	2,919	7,689	8,543					
Imperial	1,480	1,228	1,372	4,241	4,614					
Misc. Domestic	662	519	674	1,419	1,541					
Foreign	40,926	40,132	26,323	124,864	65,768					
Total—All Makes	496,717	423,793	400,763	1,340,022	1,116,821					

Source: Based on data from R. L. Polk & Co. All rights reserved. Re-use prohibited.

NEW TRUCKS

Make	March 1959		February 1959		March 1958		Three Months 1959		Three Months 1958	
	1959	1958	1959	1958	1959	1958	1959	1958	1959	1958
Chevrolet	26,259	23,761	19,383	73,577	53,936					
Ford	22,340	19,498	15,350	59,204	44,035					
International	8,625	5,109	6,840	18,586	20,779					
G. M. C.	5,680	5,249	3,977	15,942	11,562					
Dodge	6,068	3,674	3,357	13,158	9,203					
Willys Truck	1,341	1,205	1,112	3,917	2,998					
White	1,310	1,100	1,100	3,252	2,009					
Mack	1,105	937	880	3,032	2,406					
Willys Jeep	659	546	447	1,633	1,263					
Studebaker	514	476	374	1,435	1,041					
Diamond T	219	179	227	625	671					
Brockway	116	58	59	257	172					
All Others	3,357	2,896	2,377	9,239	6,206					
Total—All Makes	77,593	64,688	55,483	204,057	157,071					



**THE ONES THAT WILL LAST (and last, and last!)?
THOSE MADE OF WEIRKOTE® ZINC-COATED STEEL!**

Laboratory salt-spray tests prove it. Leading manufacturers prove it. Experience proves it. Primary window frames and storm and screen frames of Weirkote zinc-coated steel last and last and last—literally shrug off the elements!

Weirkote will not give in to corrosion invasion because its zinc coat clings tightly to its steel surface year after year. Reason? Zinc and steel are actually integrated by Weirkote's continuous process.

This extra protection pays off when it comes to fabricating Weirkote, too. You can crimp it, twist it, torture it—work it to the limits of the steel itself—without chipping or flaking its surface. And this pays off in your pocketbook: No more costly rejects, and coating after fabrication can be eliminated.

Whether you're talking profit or product, there's a lot to be said for Weirkote zinc-coated steel. Write today for a free booklet that tells all about it. Weirton Steel Company, Dept. T-14, Weirton, West Virginia.



**WEIRTON STEEL
COMPANY**

WEIRTON, WEST VIRGINIA

a division of

NATIONAL STEEL CORPORATION

Circle 125 on Inquiry Card, for more Data



Report No. 1:

MIL-L-002105A (Ord): Specification heralds a 13-year improvement in gear lubrication—possible this year!

In January, 1959, the Ordnance Corps issued a new, tentative hypoid-gear lubricant specification designated MIL-L-002105A (Ord). This specification—labeled "tentative" because it is still to be coordinated through all the military services—marks a 13-year forward jump in the technology of axle lubrication. Its importance is far reaching. Lubricants meeting this specification will create a variety of benefits for the makers of passenger cars, trucks, and buses and for their customers—the fleet operators, transportation companies, and the passenger-car-buying public.

Ordnance specifications represent a common denominator of performance. The previous specification dated back to 1946. Lubricants that met it were called "multipurpose" because they passed heavy-duty-truck-type tests and high-speed, passenger-car-type tests. However, as time passed, the adjective "multipurpose" turned into a fiction. The severity of the gear tests set up 13 years ago was quite low; there was no test to check thermal stability. With the old specification, lubrication problems began to develop, not only for the military, but also for the passenger-car-operating public.

In the early '50's—service requirements started to climb. Hypoid gears in trucks had to withstand enormously increased torque loads; the more powerful motors in passenger cars allowed higher sustained driving speeds. The gear lubricants that met the 1946 service specification were inadequate in many axles. Heavy-duty tests run by the Ordnance Corps at Yuma ('52-'54) showed that better-performing gear oils were urgently needed. The Ordnance Corps asked the Coordinating Research Council to develop a test technique more severe than the test incorporated in the 1946 specification. The Council, through its associates, worked for 3 years and devised the L-37 test; it issued in 1957.

By this time, the scoring of passenger car gears became a matter of concern for the automobile makers. In turn, the technical leaders in the automotive industry asked the Coordinating Research Council to develop a more severe test technique that would evaluate gear lubricants for anti-score service under high speeds and high peak torque operating conditions. Again, the Council complied; a high-speed scoring test was completed in 1958. It is called the L-42 test.

This series of reports is published to assist in defining the mutual interests of automotive manufacturers, axle makers, gear lubricant producers, and the military in the general recognition and adoption of the new, improved gear lubricants—now available in service stations from coast to coast. The purpose of these reports is to coordinate the re-establishment of regular drain-and-refill practices for axle differentials. This step—taken across the automotive industry—will now provide better differential lubrication in the operation of passenger cars, trucks, buses, as well as military vehicles.

These brief reports are designed to inform all levels of management in the automotive manufacturing industry of the improved axle lubrication now pending universal acceptance at the policy-making level. Technologists employed by the industry itself contributed enormously to the advancement of this narrowly understood and highly technical art. In translating this improved technology into everyday practice, policy makers in the automotive firms are urged to review with their own staff engineers the excellent work which they have contributed at the technical level.

Both of these more severe tests were made part of the new specification that issued in January, 1959—PLUS a 50-hour oxidation-stability test and a moisture-corrosion-resistance test. Some of the old gear lubes would fail this new 50-hour stability test in about 10 hours. In addition, many of the old oils lacked moisture-corrosion resistance to the degree now required "across the board."

What does this new specification mean to the automotive manufacturer? It means better engineering practices can be designed into their equipment; better long-term performance of differentials; simpler servicing practices for the equipment buyers. For the past 36 months, a variety of branded gear oils that will meet the new stringent requirements now defined by the new Ordinance specification have gone into production... have been filling the channels of distribution. Over 30 oil companies supply these new, improved gear oils.

Today, the automobile and truck manufacturer can drop the defensive action of a "sealed-in" factory-fill lubricant with limited optimum service, can return with confidence to regular drain-and-refill practices. The reasons why and the benefits that will accrue will be covered in the next report in this series. This REPORT NO. 2 will be published in this same publication's next issue.



The additives for

formulating these improved gear lubricants are sold competitively in ample commercial supply.

* cylinder
dollars
do extra duty
in **O-M**
Adjustable
Stroke
Components




Air—150 psi
Hydraulic up to 500 psi
Meet JIC standards

JUST a turn of the end on the adjusting rod and the stroke of this versatile O-M Cylinder is lengthened or shortened to fit the operation. This is accomplished with micrometer accuracy in a moment from the outside of the cylinder without disassembling or unmounting the unit or extra parts. Thus, you get the advantage of a special cylinder with no additional cost.

OTHER ADVANTAGES. Fits where others won't. All-steel construction with bearing surfaces of bronze. Designed right to seal right. Rod has high yield point. Can be disassembled and assembled faster than tie-rod types. Delivers continuous, smooth, dependable power at low or high speeds. Port can be oriented to any position. End plugs are tapped for universal mounting.

Available in a complete range of sizes (1½" to 8" bores) with standard, 2 to 1 or oversize rods. Also full line of mounting brackets interchangeable bore for bore. Immediate delivery on many sizes.

Mail coupon **TODAY** for Bulletin 112 featuring O-M Adjustable Stroke Air and Hydraulic Cylinders.



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MACHINE CO.**
17 143rd Street, Hammond, Ind.

☐ Have representative call
☐ Send Bulletin 112

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Company _____

Address _____

City _____ Zone _____ State _____

Circle 127 on Inquiry Card, for more Data

Mechanized Handling of Bumper Bars

(Continued from page 41)

Thereafter, the two bars are advanced until they are released, one at a time, onto a short belt conveyor, Fig. 5.

From this belt, each workpiece is picked up manually and is laid on rails along which the stamping is pushed into the flanging die of another 800-ton press, Fig. 6, the third press in the line. The die in this press is hand loaded, one stamping at a time. As two are received after each working stroke of the prior presses, this press operates at twice their rate. Flanging is done along only one edge of the bar. As the die opens, the dual jaws of an Iron Hand move the stamping out of the die and onto a belt conveyor that advances each stamping onto rails.

To load each stamping into the die of the next 800-ton press, its operator pushes the stamping along the rails until in position for the die to trim the top edge. Unloading of this die is done by a horizontal type of Sahlin extractor whose jaw first lifts the stamping and then retracts to land it onto the belt conveyor at the end of the line.

All press loading, except that of blanks in the first press and of stampings in the second press is done manually, partly because the parts are large and precise automatic loading equipment would be expensive. As an operator is used at all presses, he can do loading and keep pace with the line easily, for parts reach him by conveyor at or near die height and very little lifting is required. Automatic unloading, however, is done very easily with simple equipment that is moderate in cost and dependable. Its use effects considerable economies and contributes materially to the efficiency of production of the line as a whole.

AUTOMOTIVE INDUSTRIES . . .

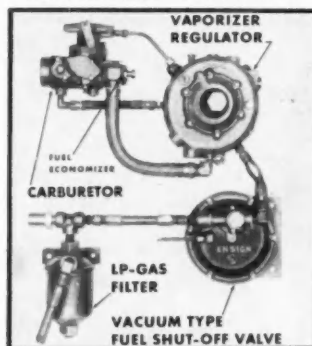
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MODEL W. VAPORIZER-REGULATOR—Small compact. Assures complete vaporization and efficient combustion resulting in clean operation, low oil consumption and long engine life.



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ENSIGN LP-GAS FILTER—Extra large cleaning capacity. Durable and dependable. Unsurpassed in construction and workmanship.



MODEL J VACUUM SHUT-OFF VALVE—Used on nearly all fork lift installations. Positive vacuum type. Used in place of solenoid valve, vacuum or pressure switch.



Switch now to LP-Gas and Save. Insist on ENSIGN—ACCEPT NOTHING LESS! Send today for free booklet "LP-GAS, the ideal fuel for industrial trucks."

ENSIGN

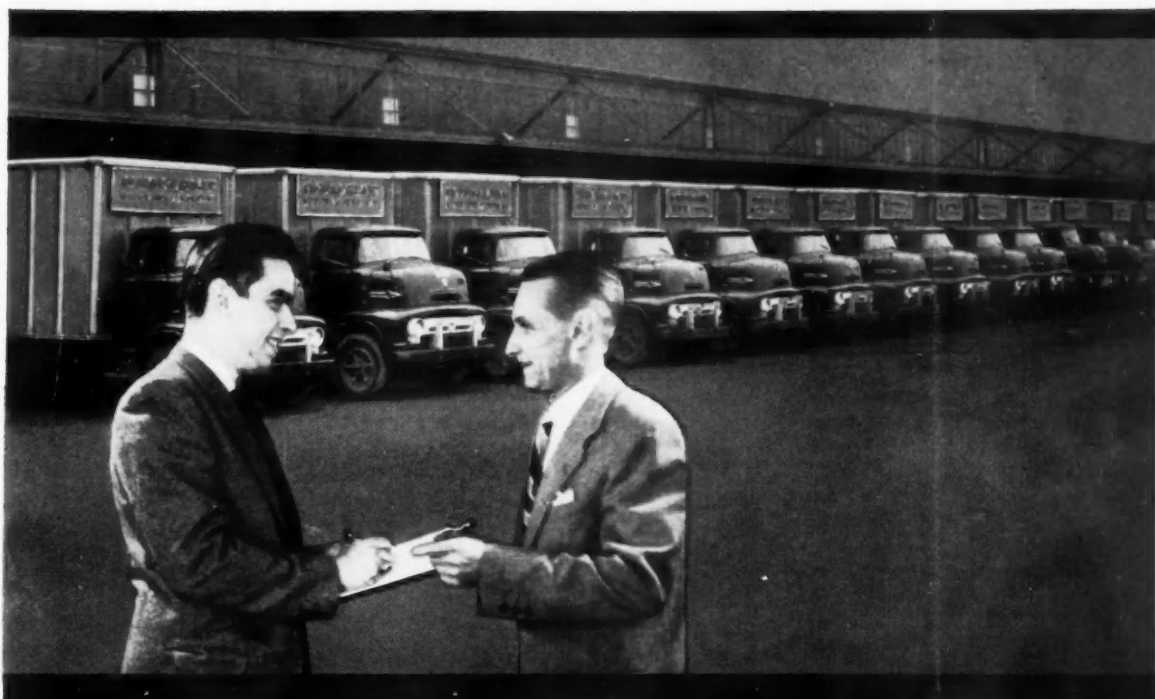
CARBURETOR COMPANY

1551 E. Orangethorpe, Fullerton, California
Branch Factory: 2330 W. 58th Street
Chicago, Illinois

Circle 132 on Inquiry Card, for more Data

LIPE Clutches Cut Truck Operating Costs

say increasing numbers of big users...

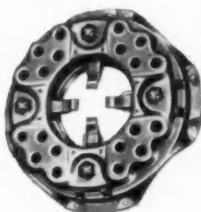


It's what the clutch does on the road that sells the experienced truck user. His only measuring stick is overall costs. In important and increasing numbers, that measure is causing him to buy Lipe Heavy-Duty DPB's . . . both on new trucks and as replace-

ments of original equipment.

Don't risk the owner loyalty of this big and growing body of users. Sell them what they want . . . LIPE . . . either as standard or optional equipment. Let the men who pay the bills prove to you that . . .

the trend is to LIPE.



For more ton-miles and more engagements between shop-stops, equip with Lipe Heavy-Duty DPB Clutches. Single and two-plate types; 12", 13", 14" and 15" sizes; torque capacities from 300 to 1900 ft.-lbs.



Here's the way things are rolling...



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Drivers choose FRAM for quality! U. S. Survey shows: Among drivers who know filters by name . . . more rank FRAM first for quality than any other filter!

Car-makers choose FRAM for dependability! More automotive manufacturers install FRAM as original equipment than any other filter!

Engineers choose FRAM for efficiency! Over 400 engine manufacturers specify FRAM Filters for their full filtering ability!



FRAM CORPORATION, Providence 16, R. I.

AUTOMATION NEWS REPORT

(Continued from page 64)

Handyman was four years in the making. It was created by the General Engineering Laboratory for GE's Aircraft Nuclear Propulsion Dept.

MOBOT MARK I

Hughes Aircraft Co. has developed a robot that looks more like a fork lift than a Frankenstein's monster. Hughes calls its device Mobot.

Hughes said the first Mobot (Mark I) will be completed for July delivery and that other versions are being planned for a wide variety of uses.

Although Mobot is a simpler machine than Handyman, it is designed to operate along similar lines.

Mobot's operator will be able to see through the robot's camera eyes, which send him a picture on a closed TV circuit. By operating electronic "reins," the operator can direct the machine to pick up and move radioactive materials.

Television cameras mounted on the walls of the "hot room" give the Mobot operator an overall picture of the surroundings. Cameras atop the machine give the operator a forward and a rear view, and other cameras on Mobot's shoulders give him a closeup of the robot's fingers at work. A microphone aboard the robot permits the operator to hear the metal fingers grasp an object.

Mobot can handle any number of tools—wrenches, screwdrivers, hammers, shears—for dismantling radioactive equipment. It can do a variety of lifting, inverting, and placing operations. It operates electrically by cable or radio link, can lift extremely heavy objects or han-

dle delicate items. Its fists and fingers can be adjusted for a light touch or a 200-lb squeeze.

B&W ROBOT FLEET

A robot fleet controlled by radio signals from a "master brain" control console will soon be in operation at Babcock & Wilcox Co.'s Engineering Prototype Development Facility, Lynchburg, Va.

The fleet, consisting of six units, is part of a program aimed at developing prototype equipment for advanced types of reactors that use circulating liquid metal as the atomic fuel.

Largest and most complex of the robots, according to B&W, is a fork-lift truck that weighs three tons and is eight feet high. The truck has three arms—one for manipulating, two for lifting. The manipulating arm can duplicate many wrist and arm functions. The two other arms can lift a 1000-lb object 15 ft in the air.

Other units of the robot fleet are a tow truck for radioactive loads; a pipe welder with a TV "eye" that can complete a six-inch weld in 30 seconds; a pipe cutter that can cut a 10-in. diameter pipe; and a 50-ton "flying rope" crane with a drive mechanism located behind the radiation shield rather than in the "hot" work area.

Two technicians man separate panels to control the robot maintenance force. Pushbutton messages are fed into an electronic grid complex and transmitted ultrasonically as coded commands to the robots. The audio system is also capable of sending operational sounds to the control room operators. ■

Michigan Offers 18 Courses On Late Engineering Trends

University of Michigan is offering 18 special cram courses next summer for practicing engineers and scientists who want to brush up on latest trends and developments in their fields. Courses are one or two weeks and cover aeronautical, electrical, in-

dustrial, mechanical and chemical engineering.

First courses start June 15 and include infrared technology, technical writing, and solid state. Other courses will cover such subjects as machining problems, stress analysis in design and metallurgy, and land locomotion mechanics.



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GROWTH

Someone has said that it is no longer possible for business to stand still, for those which are stationary are left behind by those who are "on the grow." Southern Screw Company's growth in a comparatively short time is due to its ability to make better products for growing customers. Southern is dedicated to making better fasteners, giving better service, providing better packaging—at prices that are fair and competitive. It is not strange that Southern Screw's growth has kept pace with those we serve.

If yours is a growth company, Southern Screw in all probability is having an important part in your progress. If we are not now growing with you, perhaps it would be mutually beneficial to become a part of each other's growth pattern.

Direct your inquiries for quotations and samples to: Southern Screw Company, P. O. Box 1360, Statesville, North Carolina.

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Circle 130 on Inquiry Card, for more Data

METALS

(Continued from page 47)

second half of the year as several important new producers come on stream, an Asarco executive declared that prices are likely to be more stable in the future because of more adequate supplies.

Demand Declines in Europe

Sentiment abroad is less bullish

than earlier in the year because of softer demand from Russia and the satellite countries. But this could veer quickly to the buying side if consumers displayed real fear of a shortage and stepped up inventory accumulation. No doubt some of this has been going on, but the extent of such buying is unknown.

As the summer months are traditionally dull in the copper trade, a lull in normal buying is forecast if a strike is avoided. The over-

supply of aluminum and price weakness in some areas naturally have an effect in those fields where copper is competitive.

Zinc Shows Moderate Improvement

Zinc statistics for April were only moderately good. Deliveries increased 4500 tons and slab production was slightly off. As a result, stocks at smelters declined about 2100 tons, but they are still over 13,600 tons higher than on January 1.

Some allowance should be made for the shorter month. Continued excellent demand came from the galvanizers, with consumers anxious to contract on a firm price, rather than on a monthly average basis.

The feeling persists that a price increase is ahead, and this of course is spurred by the two advances in the lead price, which usually acts as a pretty good portent for zinc. Advancing prices for zinc on the London Metal Exchange lend additional support.

Production Cutbacks

World producers of lead and zinc have voluntarily agreed in principle to reduce supplies of both metals—lead by 90,000 metric tons and zinc by 104,000 tons annually—to try to bring about a better balance between supplies and consumption. This was announced by the United Nations, covering a report of a meeting attended by representatives of 21 nations.

It was estimated that a surplus of 120,000 tons of zinc was indicated for 1959, hence the proposed curtailment, if achieved would bring it down to manageable limits. There are as yet no formal commitments by all the producers, although some of the largest companies have already announced cutbacks from 5 to 10 per cent in annual rate of output.

Obviously, a definite and effective agreement between all producers will be very difficult to achieve and unwillingness of any one large producer to join with the others could well wreck the plan. About the only certain thing is preparation of better statistical



Production exceeds 150,000 a day. The product may be a valve seat insert, a valve lifter, or similar high volume casting.

These advantages have been made characteristic:

- Tolerance is $\pm .010$
(in some instances, much tighter)
- Concentricity is near perfect.
- Minimum finish stock is required.
- Surface finish is excellent.
- Chemistry and metallurgy are closely controlled.
- Rejects are extremely low.

It took painstaking hours, and incorrigible enthusiasm, to achieve these six. Behind them are control methods so meticulous that ECI is often called "the prescription counter foundry." But, such are the assets which have built this business. We believe that they will keep it growing.



Licensed Producers of Ni-Hard, Ni-Resist,
Ductile Iron, and Ductile Ni-Resist

ENGINEERING CASTINGS, INC.
Marshall, Michigan

KNOW YOUR ALLOY STEELS . . .

This is the first of a series of advertisements dealing with basic facts about alloy steels. Though much of the information is elementary, we believe it will be of interest to many in this field, including men of broad experience who may find it useful to review fundamentals from time to time.

What is an Alloy Steel?

Here is an easy definition to remember: An alloy steel is a grade of steel in which one or more alloying elements have been blended to give it special properties that cannot be obtained in carbon steel.

Or, here is the metallurgical definition: An alloy steel is one in which the maximum specified content of alloying elements exceeds one or more of the following limits—

Manganese, 1.65 pct; Silicon, 0.60 pct; Copper 0.60 pct

or in which a definite range or a definite minimum quantity of any of the following elements is specified or required within the limits of the recognized commercial field of alloy steels: aluminum, boron, chromium up to 3.99 pct, cobalt, columbium, molybdenum, nickel, titanium, tungsten, vanadium, zirconium, or any other element added to obtain a desired alloying effect.

As a rule, alloy steel is more difficult to make than carbon steel. There are more elements to be kept within specified ranges and, in general, the ranges of the alloying elements are comparatively narrow; hence the mathematical chances for producing off-heats are correspondingly increased. Moreover, most alloy steels require special reheating and cooling during processing

to prevent such imperfections as flaking and cracking.

Surface imperfections must be removed from the billets by scarfing, chipping, or grinding. More exacting methods of testing and inspection are necessary to insure uniformity.

Where Does It Pay To Use

Alloy Steel?

Generally speaking, it is advisable to use alloy steel when more strength, ductility, and toughness are required than can be obtained in carbon steel in the section under consideration. Alloy grades should also be used where specific properties such as corrosion-resistance, heat-resistance, and special low-temperature impact values are needed.

In some cases it requires considerable study to determine when and how to use a particular alloy steel to advantage in a product. Where there is any problem or doubt concerning its use, Bethlehem metallurgists will gladly give impartial advice on analysis, heat-treatment, machinability, and expected results.

In addition to manufacturing all AISI standard alloy steels, this company produces other than standard analysis steels and the full range of carbon grades.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation.
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BETHLEHEM STEEL



data on an international basis and their prompt release to industry.

More Zinc in Automobile Die Castings

The automobile industry is taking more zinc, and diecasters are turning to zinc from aluminum. The two metals are fiercely competitive in the diecasting field, but it is reported that difficulty in making grilles from aluminum, plus the favorable price of zinc, has caused a switch to the other metal. Business from the diecasters has been disappointing this year.

Aluminum Production, Demand Increases

The aluminum industry has made new monthly and quarterly records this year, with sales and shipments reaching new heights. Sales of the three major producers totalled \$393 million in the first quarter, up 31 per cent over the comparable 1958 period. Not the least gratifying factor is that virtually all sales were made to in-

dustry, while in 1958 deliveries to the Government stockpile constituted a considerable proportion.

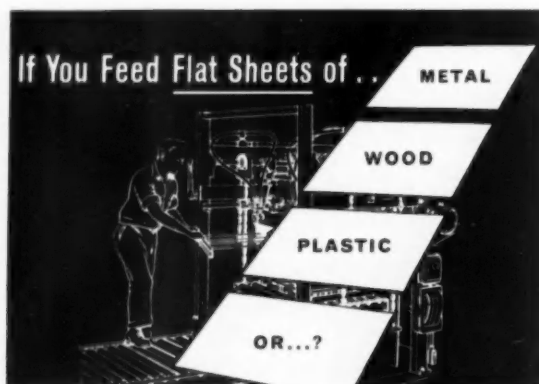
Along with increased sales came larger production. Alcoa raised its output to 83 per cent of capacity by restarting two idle potlines, thus boosting production by an annual 40,000 tons. Reynolds increased its output by 4 per cent or 30,000 tons, raising its rate to 93 per cent of capacity. Kaiser likewise reactivated an idle potline. In short, the primary industry is now producing aluminum at a rate of more than 5200 tons a day for the first time in history.

Nevertheless, with new production facilities coming on stream and reactivation of others until recently maintained on a stand-by basis, the industry still finds itself in the predicament of running with all possible speed just to stand still. The increased sales volume is just about balanced by completion and installation of new potlines, which have boosted domestic capacity from 2,184,250 tons at the first of the year to approximately 2,266,-

500 tons by June 1. As a result, the present excellent rate of shipments is little changed from the 82-83 per cent of the effective capacity that prevailed earlier in the year.

Price Rise Considered

The industry will soon be confronted with wage demands by its workers when contracts expire the end of July. If granted, they would normally be accompanied by a higher price for pig and ingot. With large unused capacity present in the industry and the threat of increased imports with the opening of the Seaway, a price increase will not be easy to obtain, in the opinion of the Alcoa chairman. Imports of semi-finished aluminum increased 40 per cent last year. While foreign aluminum accounts for but a trifle of mill products consumed by domestic industry, their impact on prices is disproportionate to their quantity. Yet aluminum producers can point out that their industry is the only one among non-ferrous metals that is



Increase Production Line Efficiency with DEXTER AUTOMATIC FLAT SHEET FEEDERS

No matter what the application there's probably a Dexter Automatic Sheet Feeder to make your sheet handling more efficient. Dexter Feeders are built in over a hundred sizes, load capacities, and speeds...to handle all types of materials...metal, plastic, wood, glass, masonite, etc. Investigate how Dexter Automatic Sheet Feeders may improve your production efficiency. We'll be pleased to discuss your operation at no obligation, of course.

THE DEXTER COMPANY
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Put our 87 years experience to work for you—Auburn's engineers are tops in their field in designing and fabricating precision sealing devices. Their know-how is at your command. "O" Rings are a specialty with us.



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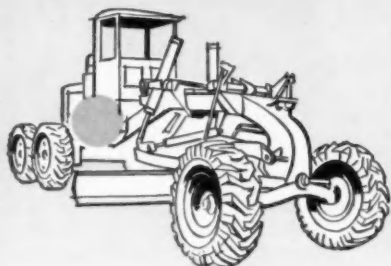
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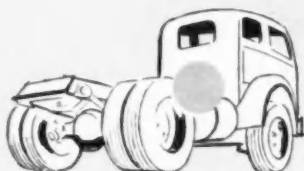
318 Stock St., Middletown, Conn.

New York, N. Y.; Rochester, N. Y.; Detroit, Mich.; Chicago, Ill.; Minneapolis, Minn.; Pittsburgh, Pa.; Cincinnati, Ohio; Ridgewood, N. J.; Atlanta, Ga.; Memphis, Tenn.; St. Louis, Mo.; Camden, N. J.; Washington, D. C.

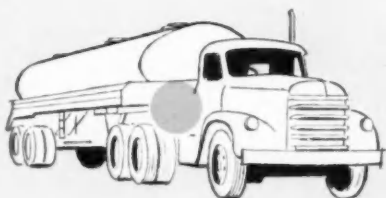
Circle 134 on Inquiry Card, for more Data



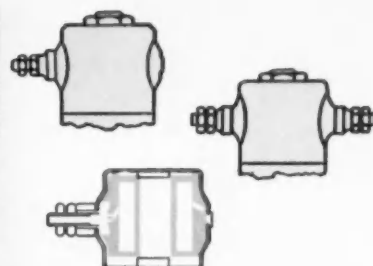
Automatic diesel governor control. To improve brake life and save fuel this motor grader uses a Skinner V5, three-way, normally open solenoid valve to relieve pressure in the hydraulic actuated engine governor. When the brakes are applied, the valve is energized by a pressure switch on the master cylinder causing the valve to close and bypass oil from the governor cylinder which reduces the pressure and throttles the engine.



Saddle tank operation. Energized by a standard dash-mounted toggle switch, a Skinner valve makes fuel level readings and tank switching a one-step, push-button operation. Valve reduces accident hazard by preventing driver's attention from being diverted; saves on labor and materials by eliminating fuel piping.



Propane and butane fuel cut-off. On trucks using liquid propane or butane fuel, Skinner V61 solenoid valves are used as a safety device to automatically shut off the tanks from the fuel system when the vehicle is not in operation. The valve is installed on the line ahead of the vaporizing unit and is energized by the ignition switch. Skinner valves for this application are approved by the Underwriters' Laboratories.



Skinner solenoid valves are available with single or double automotive terminals; specially designed automotive housings with potted coils (coil, housing leads and flux plate are potted with a compound to make them vibration-proof and moisture resistant); and waterproof molded coils that operate in all types of weather, under the severest conditions—even under water.



Additional features of Skinner automotive valves include: stainless steel internal parts; soft synthetic, long-lasting inserts that provide bubbletight sealing; spring-loaded plungers; mounting in any position; orifice seats with radius with well-rounded contact area and high finish for long insert life. All valves are built to the highest UL standards for the convenience and safety of the automotive industry.

Skinner solenoid valves help solve automotive problems like these

SKINNER SOLENOID VALVES ARE DISTRIBUTED NATIONALLY. For complete information, contact a Skinner Representative listed in the Yellow Pages or write us at Dept. 336.



THE CREST OF QUALITY

SKINNER

ELECTRIC VALVE DIVISION
NEW BRITAIN
CONNECTICUT
105 EDGEWOOD AVENUE

selling its metal not only at no advance, but at a lower level than a year ago, in spite of higher labor and other operating costs.

Lead Price Raised, Sales Higher

Unpredictable lead again confounded the statisticians when a sudden strong demand resulted in boosting the price to 12 cents a pound. This was an increase of one cent a pound in less than three weeks.

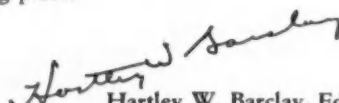
During this time sellers got rid of nearly 50,000 tons, the biggest sales volume in some time. There were no special reasons for the upsurge in orders, except perhaps the belief that lead was cheap at 11 cents and would not sell lower. The constructive reports from the United Nations that voluntary curtailments in output had been endorsed, no doubt added strength to the market. But the fact remains that lead stocks are still uncomfortably high and show an increase of 70,000 tons over a year ago. ■

Information for Authors of Technical Articles for AUTOMOTIVE INDUSTRIES

Authors of technical papers proposed for Automotive Industries Magazine are invited to write to the editors for comments and suggestions before sending in final drafts of the articles. The following procedure will save time and effort for both the authors and AI Editors, if followed by prospective contributors:

1. Clearly define the subject of the proposed article. Avoid vague descriptive terms.
2. Briefly summarize the Author's special qualifications for writing the article.
3. Prepare a 150 word summary or outline of the proposed text, telling the following details:
 - a. What industrial production, design, tooling or engineering problem will be discussed.
 - b. What benefits in reduced costs, increased output, reduction in idle machine time, improved tooling, or use of materials resulted.
 - c. What sketches, illustrations or drawings are available.
 - d. What data or tabulated figures are available?

If you do not have a current topic or subject for an article at this time, but would like to be considered as a prospective author of a future article, write for the AI—"Letter to Contributors" for guidance on your article-writing plans.


Hartley W. Barclay, Editor
AUTOMOTIVE INDUSTRIES
Chestnut and 56th Streets
Philadelphia 39, Pa.



The U. S. spent more than \$15 billion in the past ten years on research and development of long-range missiles.

Real national output of goods and services is up over 40 per cent since World War II, and output per capita has advanced more than 20 per cent in the same period.

Use of galvanized steel sheets in domestic automobiles increased by more than 700 per cent since 1954. In 1958, the average automobile used 63 lb. compared with only 8.9 lb in 1954.

Total number of tons of galvanized steel sheets shipped to the automotive industry rose from 24,400 in 1954 to 133,215 tons in 1958.

Modern automotive oil filters can remove particles of dirt as fine as 1/100,000th in. from circulating oil in a car's lubrication system.

A good quality oil filter will trap as much as 1 1/4 lb of sludge in 5000 miles of engine operation.

The earning rate as a percentage of sales for 39 aircraft and parts companies declined to 2.6 per cent in 1958 compared with 3.0 in 1957. This is just half the average earning rate of 5.2 per cent for all manufacturers.

A propulsion laboratory which tests new engine designs can simulate temperatures, plus or minus, over a band of 2000 F.

Use of titanium alloy in a turbojet engine reduced its weight by 443 lb.

Fatigue test of a turbojet compressor blade includes 100 million vibrations to determine the vitality of the metal.

Another new development from Detrex:

HOT OR COLD Phosphate Coating Processes



Improve Your Quality With Detrex PAINTBOND

Depend on Detrex for every
Metal Cleaning and
Processing need

- PERM-A-CLOR NA (Trichlorethylene)
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World's Largest Exclusive Producer of
Cleaning Chemicals and Equipment

Now, Detrex offers new PAINTBOND processes tailored to your exact needs. These tested and proved processes include chemicals for applying zinc-iron phosphate and iron phosphate coatings to steel, iron, zinc or cadmium surfaces—whether the application is by spraying or immersion, or the preferred method is hot or cold.

Regardless of your location, Detrex' nation-wide technical service is at your disposal. A trained Detrex service engineer will be glad to review your process and make the proper recommendation to improve quality and reduce the unit cost of your operation. And he will make periodic call-backs to aid you in maintaining maximum quality and efficiency at all times.

DETREX

CHEMICAL INDUSTRIES, INC.

Box 501, Dept. AI-659, Detroit 32, Michigan

The Material Handling Institute's EXPOSITION of 1959

PROGRAM, CONTINUED FROM PAGE 48

Chairman

Professor Byron Saunders, College of Engineering, Cornell University, Ithaca, New York.

Panel

John Moskowitz, Engineer in Charge of Material Handling, and William O'Grady, Project Engineer on Power Plant Construction, Philadelphia Electric Co., Philadelphia—"Coal Handling Facilities at a Power Generating Station."

George E. Waldron, Production Manager, Carling Brewing Co., Cleveland—"An Engineered Case Handling System in a Modernized Brewery."

THURSDAY, JUNE 11

American Material Handling
Society, Inc.

APPLICATION TECHNIQUES

Chairmen

Joseph F. Carle, Vice-President,
Lincoln Extension Institute, Inc.,

Cleveland; and Ralph Riener, Product Mgr., Concrete Products, Cleveland Builders Supply.

Speaker

Norman Schaffer, Material Handling Engineer, Western Electric Co., Allentown, Pa.—"How to Get Personnel to Accept New Ideas in Material Handling."

Panel

Myron Miller, Supervisor of Safety at East Pittsburgh Works of Westinghouse Electric Corp., and Regional Vice President of American Society of Safety Engineers—"Safety Training for Material Handling Personnel."

Jack Vander Molen, Crane Company, Chicago—"How Can Material Handling Solve Production Problems."

Thomas Wharton, Container Laboratories, Inc., Washington, D. C.—"What the Material Handling Engineer Should Know About Packaging."

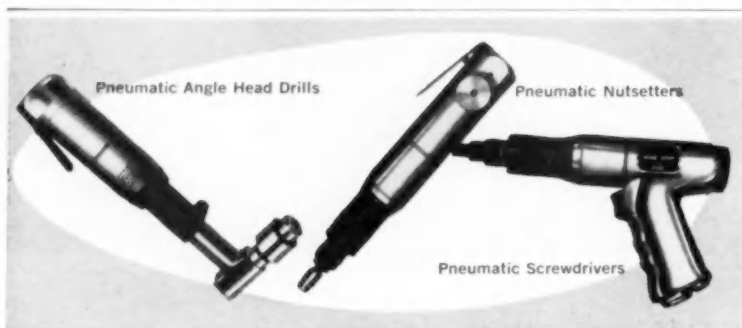


Pressure groups for more Federal spending grow alarmed as the Congress moves toward economy, away from free-wheeling spending. One example: National Rivers and Harbors Congress, a lobby advocating bigger Government spending for waterways improvement, sets theme, "New starts must NOT be stopped" for its annual meeting in mid-May.

"In view of the threat to the water development program, it is imperative that you attend this Washington session," the rivers and harbors lobby warns its members. (Congress is voting many hundreds of millions this year on existing projects, but what worries this spending lobby is that Congress may hold list of new projects to a minimum.)

Unions fume over what they call "poor results" from this year's Congress. Some union lobbyists are tartly reminding senators and representatives of labor's cash contribution last year. Some not-very-subtle nudging from the AFL-CIO hierarchy is aimed at getting Federal dollars for distressed areas, more public works projects.

Labor reform is heading for oblivion. Despite earnest pleading from Ike for clean-up bill with guts in it, congressional leaders claim the Kennedy reform bill will do the job. House members, as a result, are faced with taking the Senate-passed soft-reform bill or no reform at all this year.



HOW TO HELP 1 MAN WORK LIKE 2

Airetool production equipment delivers more power per pound of tool . . . operators get more work done without extra effort. You, too, can step up output per man-hour when you equip workers with fast-working Airetool pneumatic tools. For full details about Airetool air-powered screwdrivers, nutsetters and angle head drills, write for Bulletins 67 and 68. Airetool Manufacturing Company, Springfield, Ohio.

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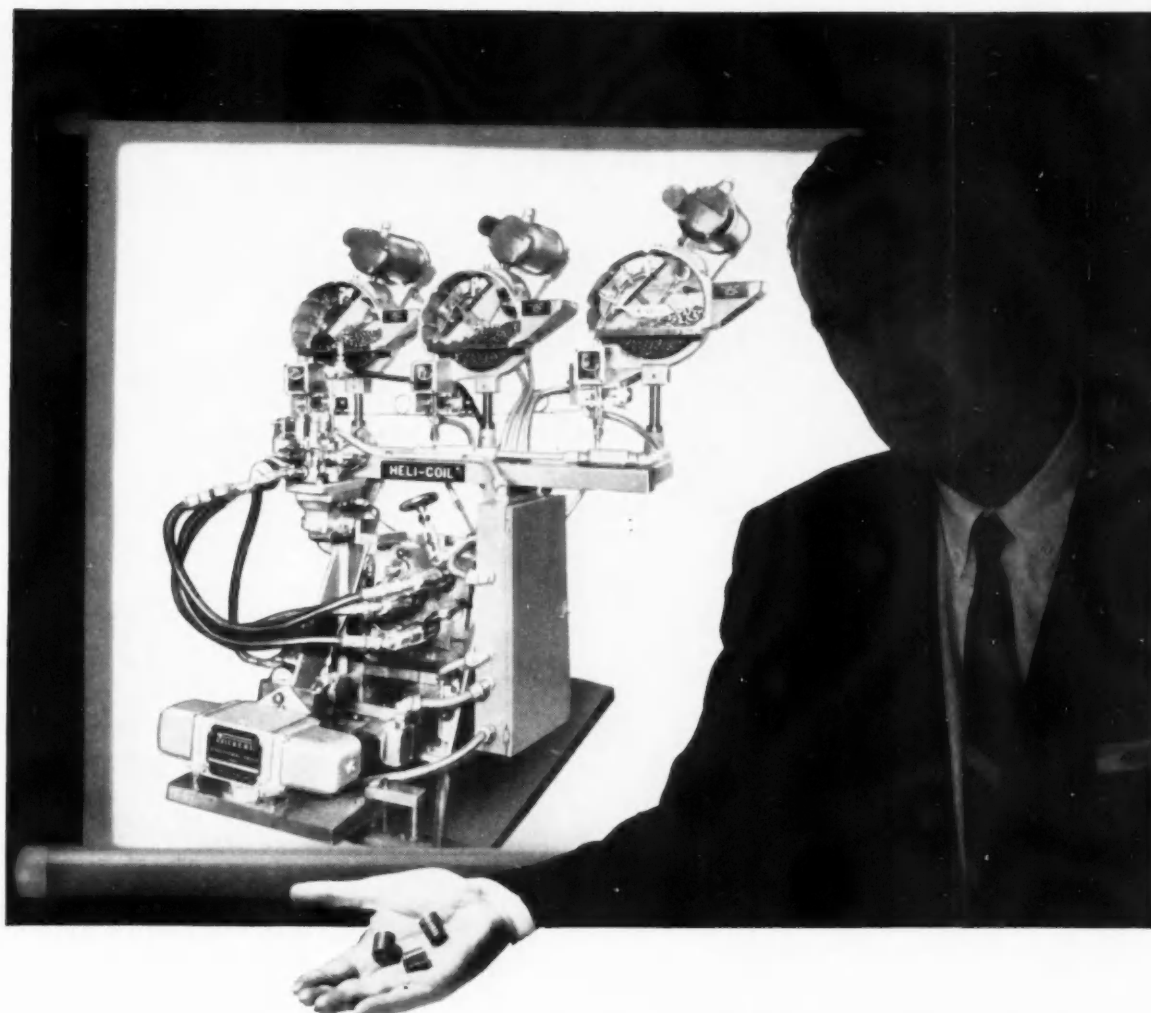
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“Automatically installed, these Heli-Coil® Screw-Thread Inserts give Ford aluminum housings permanent steel threads.”

Automatic, high-speed machines are installing these Heli-Coil steel wire thread inserts on Ford production lines right now. Designed and built by Heli-Coil engineers, they automatically position and install three inserts in an aluminum transmission housing in seconds.

Heli-Coil Inserts give aluminum threads the strength of steel for the life of the unit. Without them, tapped holes in the starter mounting pad would have been too soft to resist wear under vibration, impact and occasional removals of the starter for service.

Use of Heli-Coil steel inserts opens up new design possibilities for your light metal assemblies — and automatic equipment can be built to meet your exact requirements! Here's what Heli-Coil Inserts will do for you —

- hold screws or studs secure under impact and vibration
- prevent thread wear, stripping, corrosion, galling and seizing even in soft metals
- allow repeated assembly and disassembly without loss of thread strength
- permit use in standard proportion bosses without need for redesign

- can be specified for a complete range of U.N.C. and U.N.F. thread sizes as well as spark plug and pipe thread series
- save assembly time, space, weight and cost

For complete design data on Heli-Coil Screw-Thread Inserts, clip and mail the coupon.



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DANBURY, CONNECTICUT

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3206 Shelter Rock Lane, Danbury, Conn.

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*Improved Hydraulic Suspension
by Mather . . . about 10 B.C.*

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MATHER
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SUSPENSION
PROBLEMS,
TOO**

Please pardon the slight exaggeration . . .
Mather is really only fifty years old but during
these years, we've gained a "heap" of
suspension knowledge.

Mather has the experienced manpower, the
research, design and manufacturing facilities to
help you with your specific suspension needs.
These Mather services are always available for
the improved performance of your products.

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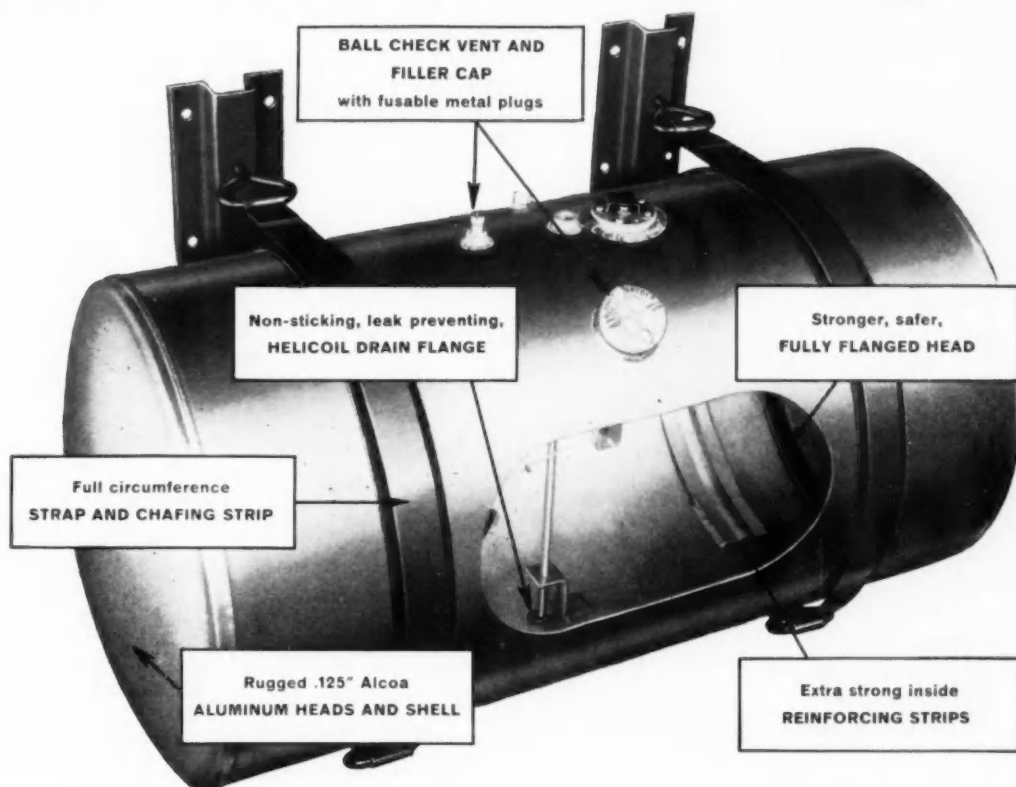
THE MATHER SPRING COMPANY

TOLEDO, OHIO



SNYDER ALUMINUM TANKS

proven in service — cut tank weight 50%



The main reason why the up-to-date trucker picks aluminum tanks is the *increased* payload made possible by savings in weight.

But, that's just the *beginning* with Snyder because Snyder Tanks bring you less weight with no sacrifice in either strength or durability. See for yourself.

Start with the basic material of construction. It's rugged Alcoa aluminum, .125" thick, non-sparking, and resistant to corrosion. No rust, no need to paint it, ever.

Then, look *inside* this Snyder tank. Note how the inside reinforcing strips add extra strength. Next, look at the theftproof baffling that prevents syphoning.

Also Available...

SNYDER CENTER STEP ALUMINUM TANKS I.C.C. LABELED FOR GASOLINE USE

Select from four models with capacities from 44 to 74 gallons. And remember, with a dual aluminum tank installation, your weight savings are doubled!

Check, too, the helicoil spring in the drain plug. You never have to worry about sticking. And the helicoil does away with soft aluminum threads which could wear and cause leaking. Finally see how the heads are fully flanged with all seams lap welded. No weak points, anywhere.

And outside? You'll find a specially designed ball check vent and fusible metal plugs in the filler cap that provide protection in case of fire. Mounting straps run full circumference, with a bracket specially designed to prevent chafing. Naturally, the label tells you that this tank meets all I.C.C. requirements. In sizes from 37 to 72 gallons.

Write today for your free Snyder Tank Catalog. And, don't settle for just any aluminum tank...

For safety, satisfaction and service, be sure to:

ALWAYS SPECIFY

SNYDER

SNYDER TANK CORPORATION

P. O. Box 14, Buffalo 5, N. Y. • Phone TRIangle 7100

New slipper design packs a lot of hydraulic pump into a small package



Two-speed
transmission pump



Power
steering pump

Thompson Pumps for Power Steering, Transmissions and Industrial Applications are Compact, Efficient, Low Cost



This "slipper" is the main reason why new Thompson-Federal hydraulic pumps perform so much better and last longer . . . yet cost less.

Because it is wider, the Thompson "slipper" contacts the pump bore over a broad area . . . gives a better seal for greater efficiency and long service at high speed. Self-lubricating, the "slipper" glides on a film of oil.

The wide, strong "slipper" is self-aligning, doesn't need the support of a close fitting channel in the driving rotor. Thompson pumps maintain their high efficiency for a lifetime of use.

The Thompson "slipper" is short, permitting a more compact pump. And Thompson's novel porting arrangement produces a non-pulsating discharge for quieter operation over a wide speed range.

Thompson power steering and transmission pumps are giving excellent service in thousands of vehicles on the road today. For information on how Thompson pumps can help improve the performance of your products, write or call Thompson Products Michigan Division, Thompson Ramo Wooldridge Inc., 34201 Van Dyke, Warren, Michigan, Jefferson 9-5500.



AUTOMOTIVE GROUP

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Automotive Power Steering Manufacturer Specifies



Cold drawing Ostuco tubing through precision ring die on cold draw bench at Shelby mill. Mandrel controls and sizes I.D.

“Automotive components are our business. We have produced literally millions. And we're still learning every day.

“One of the lessons we learned early in the game is that you can't beat Ostuco tubing for surface finish. It cuts our machining costs, keeps us on top competitively.

“There are other reasons, too, why Ostuco tubing tops our preferred list. We like its consistently close tolerances and unvarying quality, shipment after shipment. You might say we like its product integrity...”

To learn more about what Ostuco tubing can do for your production, contact your Ohio Seamless representative, listed in the Yellow Pages, or the mill at Shelby, Ohio — Birthplace of the Seamless Steel Tube Industry in America.

AA-9431




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Circle 142 on Inquiry Card, for more Data



MORE WHEELS LIKE THESE MAKE YOUR BUSINESS GO ROUND

A little to the left — lower it — lock it on — and another motor scraper is just about ready to roll.

But it's barely the beginning, "Staggering" is the only word for the federal highway program, and staggering is the quantity of construction vehicles and equipment needed to complete it. *And this means more business for you!*

Total expenditures, federal and state, are expected to top 100 billion before it's done. Over \$20 billion will go for roadbuilding equipment alone!

Already the tremendous demand for new powered construction and materials-handling equipment is being felt. Manufacturers are planning and tooling for it NOW: evaluating new products and components to build into their equipment, studying new processes and methods to build it faster, better, more economically.

This mounting demand is creating tremendous sales potential for you! That's why the time to sell is NOW — and the place to keep selling is AI. Because powered construction equipment represents only one "cylinder" of the \$32 billion, 8-cylinder AI market that includes Passenger Cars; Aircraft and Missiles; Trucks, Buses and Trailers; Tractors and Powered Farm Equipment; Military Vehicles; Engines, Parts and Accessories. Only AI gives you all 8 cylinders!

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Contact your nearest rep and learn why!

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MANUFACTURING COMPANY... one of
6,207 plants comprising the \$32-billion
automotive and aviation manu-
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MOTIVE INDUSTRIES.

Continental has the cure for vibration "headaches" the one-piece locking screw that won't work loose

**IN MARKET CARTS — STAY TIGHT,
RESIST SHOCKS OF SEVERE SERVICE**



HOLTITE NYLOK hex head cap machine screw fastens chrome-plated steel tubing at right angles. Driven through holes in one section into tapped steel plug in end of adjoining part. Hold securely despite punishment of customer use.



**IN CARBURETORS — HOLD AD-
JUSTMENT OF ANTI-STALL CONTROL**



Hex head steel HOLTITE NYLOK machine screw maintains constant adjustment of anti-stall device attached to carburetors. Holds spring at required tension without variation through wide range of temperature changes.



**IN EXHAUST FANS — HOLD MOTOR
SECURELY DESPITE VIBRATION**



Phillips truss head steel HOLTITE NYLOK machine screws are driven through rubber insulation mount into flange of vertical mounted motor. Screws do not loosen, resist constant vibration.



**IN SHEARS AND SCISSORS — HOLD
BLADES IN PROPER ADJUSTMENT**



Binding head steel HOLTITE NYLOK machine screws are driven through drilled hole in one blade into tapped hole in mate. Hold proper blade contact, — permit easy disassembly for sharpening.



HOLTITE® NYLOK® Self-locking Screws

HOLTITE® NYLOK machine screws are the simplified self-locking fasteners with the Nylon insert that eliminates the need for lock washers, jam nuts, wiring and similar devices. If you have assemblies where screws *must* stay where they are set, NYLOK is your practical choice. The applications above show how you can save trouble and complaints, — give your product a sales advantage.

CHECK YOUR ASSEMBLIES — find out where Continental engineered fasteners, like HOLTITE NYLOK, can cut your assembly costs. Plan now to consult the Continental Assembly Specialists. They will analyze your operations and tell you which fasteners — *standard* or *special* — can save you most. For prompt service, write or phone: Continental Screw Co., 451 Mt. Pleasant St., New Bedford, Massachusetts.

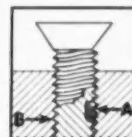
CONTINENTAL
SCREW COMPANY, NEW BEDFORD, MASS.
HOLTITE FASTENERS

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RESEARCH ENG. & MFG., INC. SUBSIDIARY**



Resilient nylon plug (A) sets up a lateral thrust, smoothly wedges mating threads together (B). All locking action is on threads: head is not stressed. Locking is positive . . . seated or unseated.

**One piece — no separate parts
Can be removed and replaced
Interchangeable — reusable
Locks seated or unseated
Acts as seal for gases, liquids**



HOLTITE PHILLIPS
AND SLOTTED HEAD
WOOD • MACHINE • TAPPING
THREAD FORMING •
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INSERT BITS AND HOLDERS



EYE APPEAL



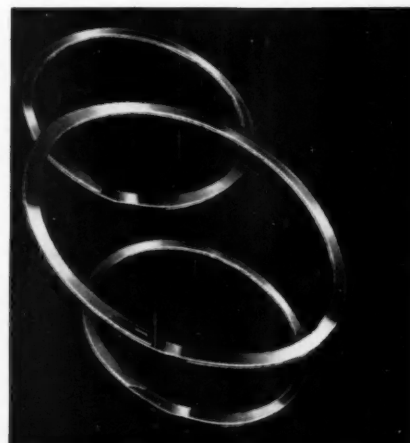
ONLY RAMCO MAKES BOTH TYPES OF MODERN RETAINING RINGS

TO SOLVE ALL
EYE APPEAL
PROBLEMS

SpirOlox

A time-tested Ramco design; full-circle 360 degree retaining ring opens up unlimited possibilities for improved design and economies in thousands of new or present products.

- ✓ Uniform wall allows installation with minimum clearance.
- ✓ Two turn, full-circle design eliminates gaps.
- ✓ No special tools needed for installation or removal.
- ✓ No tooling needed for prototypes—complete design flexibility.
- ✓ Develops a unique "friction lock" under load.
- ✓ Always uniform in quality.
- ✓ Special designs for high speeds or tolerance stack-up problems.



CircOlox

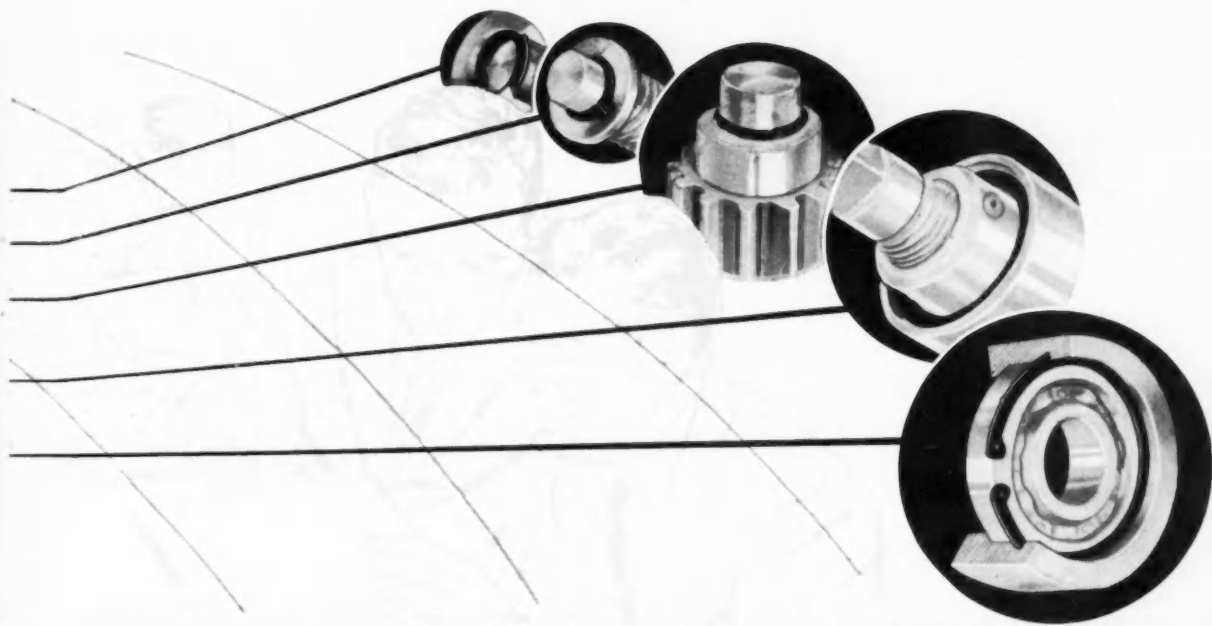
The answer to easy, lightweight, low cost assemblies and reduced manufacturing costs. Made in a variety of types and sizes for the smaller shaft or housing diameters.

- ✓ "Deep-groove" design permits maximum thrust with minimum weight.
- ✓ Easily installed or removed.
- ✓ Available in a variety of materials.
- ✓ Wide choice of finishes.
- ✓ Always uniform in quality.
- ✓ Meets Government and Industry Standards.



Retaining Rings by **THOMPSON PRODUCTS**

another product of *Thompson Ramo Wooldridge Inc.*



APPEARANCE? ASSEMBLED COST? PERFORMANCE? WHAT IS YOUR MAJOR FASTENER PROBLEM?

If it is appearance, Ramco retaining rings can give you the one best answer!

Who thinks of eye-appeal in retaining rings? For one, your customers do...for another, Ramco does! Eye-appeal is one reason Ramco offers both types of modern retaining rings in a wide range of designs, styles, metals and finishes. For example, take the unique full-circle Spirolox...it can be furnished in bright stainless steel, blued steel, copper or gold plate...it can be used to improve the appearance of electric mixers, power tools and any product with an exposed retainer. No other retaining ring will give the sleek, modern, eye-appealing appearance. That's why we say, "Ramco has the one best answer."

But Ramco has the answers to your other retaining ring problems, too! Ramco can show you how to cut assembled cost and improve product performance with rings manufactured in the world's most modern ring plant...engineered to the highest standards established by Thompson Products and Ramco Engineering. Send us a blue print of your toughest retaining ring problem...let us give you the ONE best answer.

A special Engineering Catalog and Price Lists are yours without cost or obligation. Why not mail the coupon for your free copies TODAY?

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Send latest Engineering and Price Catalogs of Spirolox
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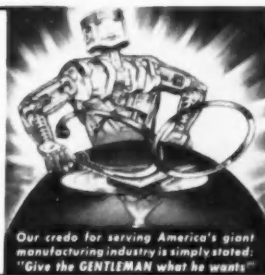
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Address.....

City..... Zone..... State.....

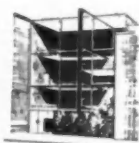
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A CHILTON



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FREE LITERATURE

Air Chucking 1

Air operated chucking systems are fully described in Bulletin PO-66D which has been published by *The Cushman Chuck Co.* In addition to illustrations and a complete listing of the line of standard Cushman air chucks and cylinders, space has been devoted to a typical application with detailed installation procedure.

Tape Control 2

A 10 page brochure on Jones & Lamson Tape Controlled Positioning describes the advantages of this method as well as illustrating various applications. The booklet also tells that retrofitting (or "Do it yourself") applications may be accomplished with packaged units offered by *J. & L. Jones & Lamson Machine Co.*

Metal Spinning 3

A 12 page brochure containing a complete description of their extensive metal spinning and hydroforming facilities is being offered by *J. Schrader Co.* Schrader spins parts up to 85 in. in diameter by 1/2 in. thick in steel, stainless, aluminum, brass, copper, Monel, etc.

Tables, Formulas 4

A booklet "Convenient Tables and Formulas" has been published by *Westinghouse Electric Corp.* The book includes 120 pages of tables, formulas, and graphical symbols summarizing electrical data, properties of materials, heat transfer and steel information, measurements, and other subjects.

Components, Fasteners 5

A 12 page, two-color catalog (359) issued by the *A. P. M. Corp.* illustrates and describes a complete line of single-unit, high-pressure seals and fasteners suitable for military, commercial and industrial applications.

Aircraft Tubing 6

Ohio Seamless Tube Div. of Copperweld Steel Co. has published a revised and up-to-date version of Technical Handbook A-2 which describes seamless aircraft tubing, carbon and alloy steels. It contains 70 pages of definitions, specifications, sizes, tolerances, sampling, testing and heat treating information.

(Please turn page)

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Blind Rivets 7

An illustrated catalog (Form 8-409) describing Huck PT and 9SP blind rivets is available from *Huck Mfg. Co.* The brochure lists the advantages of the blind rivets and includes such technical information as recommended hole sizes, material specifications, shop practice notes and shear and tension strength values.

Hand Pumps 8

Four four-page brochures and two two-page units describe the complete line of internal gear rotary pumps offered by the *Wayne Pump Co., Div. of Symington Wayne Corp.* Inside

pages contain a descriptive paragraph, construction options and details, specifications, assembly recommendations, and dimensional details.

Stainless Steel Tubing 9

Small tubing drawn from PH 15-7 Mo, a precipitation-hardening stainless steel possessing good mechanical properties at elevated temperatures, is described in Special Analysis No. 120 published by *Superior Tube Co.*

Block Tools 10

Block Tool Catalog D-510 lists and describes applications of six inter-

changeable types of Davis blocks, including throwaway carbide insert type. Prices, specifications, and selection data cover blocks for boring and related operations for diameters from $\frac{3}{4}$ through 17 in. *Davis Div., Giddings & Lewis Machine Tool Co.*

Industrial Guide 11

"Dimensional Standards for Semi-Tubular Rivets," published by the *Tubular and Split Rivet Council*, is designed to facilitate the work of industrial rivet users and contains standards data on all major classes of semi-tubular rivets. It includes such information as body and head diameters, head thicknesses and radii, and hole diameter and depth figures.

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Metal Lathes 12

The complete line of Delta industrial metal lathes is described and illustrated in a 20 page catalog prepared by *Rockwell Mfg. Co's. Delta Power Tool Div.* Featured is the Delta 10-in. Metal Lathe which has a variable speed drive and $\frac{3}{4}$ in. collet capacity.

Aluminum Machining 13

Peter A. Frasse & Co. has prepared an aluminum machining chart (Sec. G, No. 2) which provides tables of recommended speeds and feeds for six different machining operations: forming, turning, drilling, boring, reaming, and cutting off. A cutting speed conversion table is included.

Test Chambers 14

A 12 page catalog covering their line of environmental test chambers has been published by the *American Research Corp.*

Sprockets, Chain Drives 15

A comprehensive, illustrated brochure and stock catalog on sprockets and chain drives has been published by the *Cullman Wheel Co.* The 88 page booklet includes full details on Cullman's 1300 different stock sprockets and its various types of roller chains.

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Magnesium Alloys 16

"Shop Guide for Elevated-Temperature Magnesium Alloys," a 28 page booklet, describes recommended practices for working magnesium alloys of thorium and rare-earth metal families. Shop operations covered are machining, forming, joining, assembly protection and finishing. *The Dow Chemical Co.*

Pressure Plugs 17

Pressure plugs which seat flush are described in Form 2501. The plugs, called Levi-Seal, are made for flush-seating to within half a pitch in hydraulic, pneumatic or other high pressure systems. *Standard Pressed Steel Co.*

Metal Tubing 18

A 12-page brochure covering welded carbon and stainless steel tubing is being offered by the *Formed Steel Tube Institute*.

Truck Bodies 19

Modern hydraulic hoists and both steel and aluminum dump bodies and dump trailers specially designed to handle maximum legal payloads and provide long equipment life are featured in a booklet on truck equipment available from *Galion Allsteel Body Co.*

Shipping Cases 20

A bulletin describing the CDF line of reusable instrument shipping cases is available from *Continental-Diamond Fibre Corp.*

Turbine Flowmeters 21

Four page Technical Bulletin 1384 describes the line of Cox Type 20 turbine flowmeters for measuring the flow of jet fuel, gasoline, oil, water, acid and alkali chemicals and other liquids. *Cox Instruments Div., George L. Nankervis Co.*

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Fittings, Flanges

22

Booklet FB-78, 12 pages, is a guide to material selection of carbon, alloy and stainless steel fittings and flanges. It covers specifications and analyses, effects of alloying elements, mechanical properties and arc welding procedures. *The Babcock & Wilcox Co.*

Plate and Face Cams

23

Eight page Catalog 900 introduces standard and semi-standard plate and face cams. Nearly 100 standard units are listed by stroke, timing and load rating. *Ferguson Machine Corp.*

Spray Painting

24

An eight page detailed bulletin describes the three steps necessary before making a selection of equipment for a specific spray painting job in order to make the most applicable choice of spray painting equipment. *Binks Mfg. Co.*

Tool Catalog

25

The Brown & Sharpe Mfg. Co. released Machinists' Catalog 37M. This 48 page publication lists the Brown & Sharpe tools generally used by machinists and toolmakers.

Design Manual

26

Engineering Design Manual TA-210G describes a complete line of standard clamps, line supports, brackets, and shims in a wide variety of shapes and sizes. *TA Mfg. Corp.*

Speed Drives

27

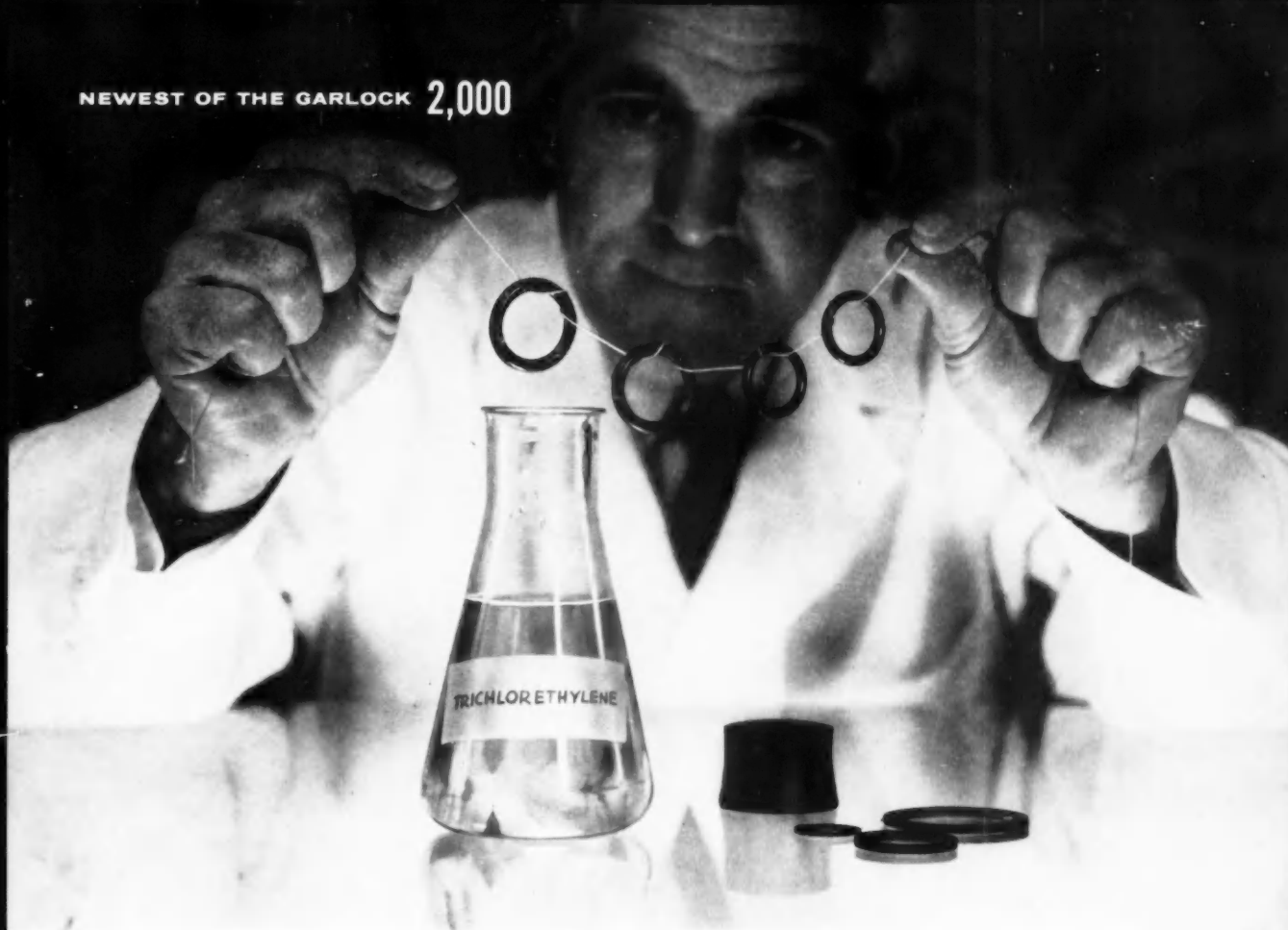
A condensed specifications bulletin describing a line of adjustable speed drives is available from *Cleveland Machine Controls, Inc.*

Portable Switches

28

Joy portable switches are the subject of a brochure released by the *Electrical Products Div. of Joy Mfg. Co.* Featured is the Joy pendant push-button station, a weathertight, corrosion resistant design completely insulated and encased in Hycar, an improved synthetic rubber compound, and listed as available in 4, 6, and 8-button styles.

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LOW SWELL, GOOD TENSILE STRENGTH DESPITE HEAT, SOLVENTS. Today's era of tremendous horsepower dictates that rubber be able to withstand not only corrosive fluids alone—nor high temperatures alone—but a combination of both. Garlock's new VITON rubber parts do exactly this. It's the only known rubber that will maintain low compression set, low swell, and good tensile strength in contact with most solvents at high temperatures.

IMMERSED FOR SEVEN DAYS. For example, Garlock VITON retains its duro, tensile strength, and elongation characteristics when immersed for one week in twenty of the most widely used—and perhaps harshest—solvents, lubricants, fluids, and acids on the market today. In the test illustrated two O-rings of ordinary Nitrile rubber and two rings of VITON were immersed in trichlorethylene; VITON (right) retained its original dimension—the Nitrile rubber (left) swelled almost 50%.

OVEN AGED AT 600° F. VITON can be oven aged in air at 600° F. for 24 hours, and at 400° F. for 2400. In both cases, it not only retains its excellent mechanical properties, but it remains usefully elastic, proving its value on either intermittent or continuous application.

OPENS MANY NEW USES. Jets and missiles are the more obvious applications for Garlock's new VITON (meets

applicable military specifications for military aircraft, etc.). However, VITON is finding important new civilian uses as valve stem seals on truck engines, pump seals on automatic transmissions, and on gasoline pumps, thermostat bellows and domestic washing machines—practically any mechanical equipment where you need rubber parts which give maximum resistance to deterioration by liquid or heat.

VITON is also available as sealing elements in KLOZURE** Oil Seals, flexible members in MECHANIPAK** Mechanical Seals, "O" Rings, Cups, CHEVRON** Packing. VITON products are the newest of the Garlock 2,000 . . . two thousand different styles of packings, gaskets, and seals for every need. The only complete line. See your local Garlock representative, or write for further information.

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